THE PHILIPPINE
JOURNAL OF SCIENCE

VOL. 56 JANUARY, 1935 No. 1

THE OCCURRENCE OF BERTIELLA IN MAN, MONKEY AND DOG IN THE PHILIPPINES

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FOUR PLATES

Early in 1934 we received from Doctor Gustilo for identification a tapeworm, which he recovered from his eight-year-old daughter, who had always resided in Sara, Iloilo Province, Panay. The tapeworm was a specimen of *Bertiella*. The general appearance of this tapeworm reminded us of a similar specimen that we had recovered at autopsy from the small intestine of a Manila dog five months previously. This specimen proved to be a *Bertiella* also, although it differs somewhat morphologically from our human material. While study of these two specimens was in progress, we received from Dr. Marcos Tubangui, of the Bureau of Science, Manila, three complete strobilæ of an apparently similar tapeworm, which he recovered at autopsy from the small intestine of a Philippine monkey (*Macacus cynomolgus*) in Rizal Province, near Manila, October 12, 1932. A study of this monkey material convinced us that, except for some insignificant difference, it is identical with our human material.

The interest that may be attached to this report is threefold: (*a*) a new area in the nosogeography of *Bertiella* is established; (*b*) a new case of *Bertiella* infestation in man is recorded; (*c*) the occurrence of *Bertiella* in the dog adds a new animal to the list of hosts for this genus. For convenience we shall call our

three lots of material by the names of their respective hosts in referring to them in this paper.

OUR HUMAN BERTIELLA

The human tapeworm, which was preserved in alcohol, appeared to be a complete strobila with the scolex missing. The entire specimen measures 160 millimeters in length.[1] The tapeworm broadens and thickens very gradually from the neck region posteriorly, being widest and thickest at about the middle of the specimen. Its broadest segments measure 11 millimeters in width, 0.2 millimeter in length, and 3 millimeters in thickness. The hindermost segments measure 7 millimeters in width, 0.45 millimeter in length, and 1.2 millimeters in thickness. The ripe segments are apparently shed not singly but in groups, since previous to the expulsion of this strobila a fragment of the tapeworm consisting of nine ripe segments was passed by the child.

Segments taken from various levels of the specimen were stained after the method of Ristroph (1934). Individual segments were also isolated, stained, and mounted in toto lying flat on their anterior or posterior border. This technic affords an unobstructed view of the internal structure, especially the reproductive glands and tubes, as it does away with the necessity of looking through the calcareous deposits and musculature, which obstruct the view when the segment is examined lying on its dorsal or ventral surface. Serial sections, longitudinal and transverse, of both mature and ripe segments stained after the above method were also prepared for study.

No description of the head can be given as this was missing in the specimen. The segments are broader than long; each segment contains a single set of reproductive organs; the genital atria alternate irregularly and are situated within the anterior half of the lateral margin of the segments. The dorsal excretory canal is smaller than the ventral excretory canal; the genital canals are dorsal to both the dorsal and ventral longitudinal canals.

Female reproductive organs.—The ovary is saddlelike in shape with its back directed ventrally when viewed laterally. Measuring about 1.8 millimeters from tip to tip in a transverse direction, it occupies about one-fourth of the whole width of the

[1] According to Dr. Gustilo the tapeworm when alive was capable of extending its length to as much as 16 inches, or approximately two and one-half times that of the preserved specimen.

mature segment, and is located well within the poral half of the proglottid. It consists of two large lobes connected with each other by a glandular bridge which communicates with a common stem. Each lobe consists of many long, fingerlike, tubular-sacular cytogenic glands with enlarged ends apparently originating from a common center. The vitellarium is also bilobed, and to some extent a copy of the ovary in general form and the relation of the lobes to each other. The lobes lie dorsally and behind the ovary, and being composed of numerous oval lobules with a tendency to form clublike ends radiating from a common center, may be mistaken for parts of the ovary. The shell gland is oval, situated dorsally and slightly anteriorly to the vitellarium. From this organ there arises a coiled tube, which empties into the receptaculum seminis. The receptaculum seminis, which is a thin-walled, oval vesicle measuring around 450 by 310 μ, lies dorsally and porally to the ovary, and anteroporally to the vitellarium, its ventral half being obscured by the latter organs when viewed from behind. The almost straight and slender vagina arises from it abruptly, like the stem of a pipe. At its point of origin may be seen clumps of deeply staining cells. The ovarian portion of the vagina, which dilates slightly after emergence from the receptaculum seminis, is about 900 μ long and 35 μ wide, while its muscular and glandular poral segment is about 400 μ long and 130 μ wide. In serial sections the poral portion of the vagina appears surrounded by a layer of deeply staining glandular cells, which seem to radiate from the lumen. The vagina, whose muscular lumen is plugged with a yellow pigmentlike material, lies alongside the cirrus in a common stroma. It opens into the common genital atrium behind and ventrally to the cirral opening. The uterus is in the form of a simple wavy tube across the segment with its trough and crest directed dorsoventrally.

In the ripe segment the medullary field is almost completely filled by the uterus, which is stretched transversely up to the lateral excretory vessels on either side in a corkscrew fashion. In serial sections it appears as a large tube with outpocketings packed completely with eggs that impart to it the appearance of a polygonal mosaic. The poral portion of the vagina persists in the ripe segment.

The eggs are roughly globular bodies with the following measurements: Outer eggshell, 55 to 73 μ in diameter; inner eggshell, 40 to 50 μ; embryo, 13 by 25 μ; hooklets, 9 to 10 μ. Freshly ob-

tained eggs from the uterus have their outer shell more or less crinkled; the embryo and the inner shell are obscured by coarse, refractile granules of varying size. After clearing, however, with Puri's fluid, the hexacanth embryo with its thick unstriated inner shell appears in full view. The egg thus cleared reminds one of the egg of *Hymenolepsis nana*. The pyriform apparatus is invariably present. It has the following average measurements: Length from base, 8 to 10 μ; width of base, 10 to 12 μ; distance of tip from outer eggshell, 15 to 18 μ.

Male reproductive organs.—The vas deferens runs towards the poral margin from the dorsal vicinity of the receptaculum seminis in three or four powerful sacculated loops before entering the thin-walled cirrus pouch, which lies dorsally and anterior to the poral portion of the vagina on the same plane as the excretory vessels. The vas deferens dilates immediately after entering the cirrus sac into a more or less globular, thin-walled seminal vesicle, which appears glandular at its junction with the straight, uncoiled, fairly muscular but slender cirrus that runs alongside of, and in close contact with, the vagina to the common genital atrium close to the opening of the vagina, somewhat dorsad and anteriad to the latter. The cirrus is unarmed and apparently unprotrusible. The testes are round or oval bodies, 78 to 80 μ by 60 to 70 μ, numbering from 200 to 250, disposed in one to eight layers, confined in the anterodorsal field of the segment. No testes are found on the ventral side of the vagina.

OUR MONKEY BERTIELLA

Our monkey *Bertiella,* preserved in 5 per cent formalin, is represented by three apparently complete strobilæ in each of which the scolex is present. It has the following measurements: Total length, 158 millimeters; greatest width, 14; greatest thickness, 4. Flattened and stained scolex measures 630 by 510 μ. The suckers have an average diameter of 255 μ. No pigmentation is noticed anywhere in the head. On comparing this material with our human *Bertiella* we noted that one is practically the copy of the other, except that the eggs of the human specimen are larger than those of the monkey specimen, a difference which we attribute to the different preservatives used.

OUR DOG BERTIELLA

Our material preserved in 5 per cent formalin consists of two specimens, a smaller, apparently immature worm about 50 millimeters long, and a larger, mature, and complete strobila, which has a total length of 190 millimeters. The short neck is immediately followed by the segments, which broaden and thicken very gradually posteriad. The unflattened scolex is subglobular and measures 900 by 650 μ. When flattened and stained it measures 820 by 560 μ. The proglottids are broader than long, and each contains a single set of reproductive organs; the genital pores alternate irregularly with a tendency to be unilateral. The mature segment is 0.7 millimeter long, 7.0 millimeters wide, and 1 millimeter thick. The dorsal excretory canal is smaller than the ventral excretory canal, and the genital tubes are both dorsal to both dorsal and ventral excretory canals.

Female reproductive organs.—The bilobed ovary, which measures 1.4 millimeters transversely, is crescent-shaped and located well within the poral half of the segment, occupying one-fifth of the width and almost the whole length and thickness of the proglottid. In transverse sections the two lobes appear to be joined together by a glandular bridge, which arises from a common stem. Each ovarian lobe hugs the corresponding lobe of the yolk glands which lie behind but in the same sagittal plane as the ovary. Sandwiched between the two lobes of the yolk glands lies the roundish shell gland, which sends out a short coiled tube that empties into the pyriform receptaculum seminis (300 by 135 μ), the latter being obscured by the poral lobe of the ovary. The vagina arises abruptly from the poral end of the receptaculum seminis and runs porally almost in a straight line until it reaches the plane of the excretory vessels, when it enlarges and becomes glandular and muscular to form its poral portion. This portion of the vagina runs alongside of the cirrus pouch and in close contact with it.

Male reproductive organs.—The testes are round or ovoid bodies, 70 by 60 μ, numbering between 75 and 100, confined in the anterodorsal field of the segment. Although a number of the testes are found on the poral side of the ovary, none is found ventrally to the vagina. The vas deferens arises from the vicinity of the poral lobe of the ovary, and after running poralwards in mighty convolutions, enters the pyriform cirrus

pouch (400 by 90 μ), which lies dorsally and behind the vagina. The seminal vesicle is a long cylindrical organ, which lacks the glandular elements found in the poral segment of the same organ in our human and monkey specimens. The apparently unprotrusible cirrus is long, slender, and straight. It empties into a short cloacal canal in common with the vagina before reaching the common genital atrium.

The description of the ripe segment of our human and monkey material applies to the dog specimen.

Although there are marked discrepancies between our dog material on the one hand and our human and monkey specimens on the other, we believe that the variations are not of specific significance.

According to Cram (1928) the genus *Bertiella* is composed at present of three species occurring in birds and nineteen species in mammals. The mammalian hosts are represented by rodents, marsupials, lemurs, and primates. However, a general review of the literature on the subject strongly indicates that many of these species are invalid or are subspecies of not more than two species. Thus, Baer (1927), quoted by Adams and Webbs (1933), reduces the recorded species of *Bertiella* to two—namely, *B. studeri* of the Old World and *B. mucronata* of the New—although the probability that *B. mucronata* is identical with *B. studeri* is pointed out by Cameron (1929). Southwell (1930) regards *Bertiella satyri* (Blanchard, 1891) Stiles and Hassal, 1902, *Bertiella conferta* (Meyner, 1895), *Bertiella polyorchis* Linstow, 1905, and *Bertiella cercopitheci* Beddard, 1911, as synonyms of *Bertiella studeri* (Blanchard, 1891) Stiles and Hassal, 1902. Joyeux and Baer (1929) also maintain the synonymy of *B. satyri* and *B. studeri.* Meggit (1927) considers the differences between *B. cercopitheci, B. mucronata, B. conferta, B. polyorchis,* and *B. studeri* to be nonspecific and such as might be produced by variations in the methods of fixation or degree of muscular contraction of the worms. It seems that *Bertiella fallax* alone, described by Meggit (1927) from *Cebus capuchinus* in Egypt, presents undoubted differential specific characters from the type species, *B. studeri.*

It appears, therefore, that the human infestation by this genus so far recorded is represented by only one species; namely, *Bertiella studeri* (Blanchard, 1891) Stiles and Hassal, 1902 (synonym, *B. satyri*).

Nine cases have been recorded so far of human infestations with *B. studeri;* namely, *Bertiella satyri* (Blanchard, 1891) re-

covered first from the orang-outang (*Simia satyri*) in Borneo, and later reported twice in man, first from a child in Mauritius (Blanchard, 1913) and then from a Bengali child (Chandler, 1925); the third case (*B. satyri*) was recorded from India (Mukerji, 1927) as occurring in a Hindu subject, although no account of the case was given; the fourth case appears to be *B. mucronata* (Meyner, 1895) Beddard, 1911, originally described from a Paraguayan black howler (*Alloutta caraya*) and reported by Cram (1928) as occurring in a young Spaniard in Cuba as well as in three young chimpanzees; the fifth record (*B. studeri*) was from St. Kitts (Cameron, 1928); the sixth (*B. studeri*) again from India (Maplestone, 1930), although in this case there seems to be some confusion about the uterus which in the author's text figure is represented as directly connected with, or rather emptying into, the deferent duct; the seventh case (*B. studeri*) was reported from Sumatra by Joyeux and Dollfus in 1931 (cited by Adams and Webbs, 1933); the eight and ninth cases (*B. studeri*) again in Mauritius (Adams and Webbs, 1933), the first from an 8.5-year-old creole child, and the second from a 4.5-year-old girl of Indian parentage borne in Mauritius. Our human case of *Bertiella* infestation represents the tenth and newest record of this genus in man and promises to involve a species different from the type species, *B. studeri.*

On comparing our human and monkey specimens with the type species, *B. studeri* (synonym, *B. satyri*) as described in Baer's account (Cameron, 1929), we found that our material differs particularly from the latter in the following respects: (*a*) The deferent canal of our specimens makes powerful sacculated coils before entering the cirrus sac, whereas in *B. studeri* the vas deferens is almost a straight tube before its entrance into the same organ; (*b*) the number of testes in our specimens is from 200 to 250, disposed in from two to eight layers—in *B. studeri* it is from 150 to 300, disposed in one or two layers; (*c*) the eggs of our specimens measure 55 to 73 μ, with a mean of ± 64.53 μ, and the embryos +16.6 μ, whereas in *B. studeri* they measure from 45 to 60 μ; the embryos, 10 to 16 μ. In view of the fact that although *B. satyri* differs from the type species, *B. studeri,* in that the ovarian portion of its vagina is enlarged as shown in Chandler's text figure (Chandler, 1925) and that there exist marked discrepancies in the disposition of the vagina and in the number of testes (only 100 in *B. satyri*) between the

two, yet the former is being considered a synonym of the latter; we, therefore, prefer to place our material provisionally under the type species, *B. studeri*, until the synonymy of the described species is definitely established. However, we feel justified in furnishing a detailed description of our material, because after all it may prove to be a new species.

In almost all recorded cases of *Bertiella* infestation in man, the subjects were young children. Mapleston (1930) has made the same observation. This phenomenon is shared by other rare human tapeworms; such as, *Davainea, Hymenolepsis, Dipylidium, Drepanidotænia,* and *Raillietina* (Faust, 1930). The authors (Africa and Garcia, 1934) report two cases of rare human tapeworm infestations; namely, (*a*) a case of a Filipino child two years old who passed spontaneously a small tapeworm, which they identified as *Davænia madagascariensis,* and (*b*) another tapeworm recovered from a hospital patient, a child also two years old, which proved to be *Raillietina garrisoni* Tubangui, 1931. The latter worm is a very common intestinal parasite of the Philippine brown rat (*Mus norvegicus* Erxleben, 1777). Joyeux and Baer (1929) are of the opinion that Garrison's *Davænia madagascariensis* and other rare human tapeworms are parasites of wild animals and accidentally transmitted to man. The fact that in most cases of rare human tapeworm infestations the subjects are young children seems to support further the hypothesis advanced by Looss (1911: 240) and shared by Sandground (1929), which seeks to explain the phenomenon of age resistance observed in certain metazoan infestations. This hypothesis is that the young of many different species of animals possess certain physiological characteristics in common, but as they grow older physiological changes along different lines develop, leading to the divergence observed in the adult. "In view of this it is reasonable to suppose that the closer the genetic relationship between two hosts, the more similar will be the conditions in those hosts when young, in so far as they will approach the requirements of the parasites for their existence. If the premise is not an erroneous one, it is not difficult to understand how a parasite, best adapted to live in one host, should be able to establish itself for a time in young individuals of another somewhat related host, yet fails to accomplish this as the host grows older and acquires specific characters that are unfavorable to the parasite."

The situation developing from the fact that most of the human infestations of *Bertiella* so far recorded have occurred in lands

where primates (orang-outang, chimpanzees, and monkeys) are in abundance and often in close association with human beings, seems to fit the hypothesis expounded above. The simultaneous appearance of *B. mucronata* in a young Spaniard and in the chimpanzees in Cuba (Cram, 1928), our own finding (this report) of *Bertiella* sp. in a child and a monkey in the Philippines, and the four reports on children from India and the nearby island Sumatra where monkeys thrive in abundance, seem to strengthen this hypothesis.

Exactly four months after receiving our human *Bertiella* from Doctor Gustilo, we received from the same source another specimen consisting of an apparently complete strobila minus the scolex, 20 centimeters long, with two groups of detached ripe segments, passed after administration of male fern. It is presumed that this specimen developed from the scolex that was left behind last April.

SUMMARY

Specimens of *Bertiella* species from a Filipino child, a dog, and a Philippine monkey (*Macacus cynomolgus*) in the Philippine Islands are described. This report provides the tenth and newest case in the list of this rare human-tapeworm infestation, establishes a new animal host for the genus, and defines a new area in its geographical distribution. A short discussion of the relation of tapeworms commonly infesting wild animals to the human host is given.

ACKNOWLEDGMENT

The writers are indebted to Dr. Marcos Tubangui, of the Bureau of Science, Manila, for his courtesy in placing his monkey material at our disposal; and to Dr. Jesus Gustilo, of Sara, Iloilo, for coöperating with us by presenting to our laboratory specimens of the tapeworm that were passed by his daughter.

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ILLUSTRATIONS

Plate 1

Fig. 1. Photograph of strobila of *Bertiella* sp. from man.
2. Microphotograph of ovum of *Bertiella* sp. from man.
3. Microphotograph of ovum of *Bertiella* sp. from man, after clearing with Puri's fluid showing the pyriform apparatus.

Plate 2

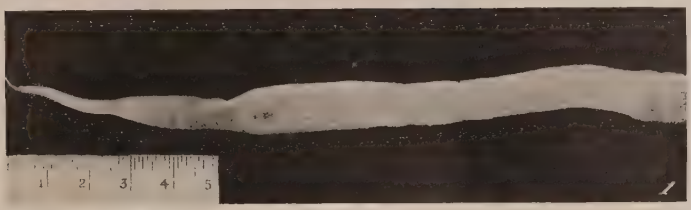
Fig. 1. Camera-lucida drawing of a mature segment of *Bertiella* sp. from man (lateral view).
2. Ripe segment of *Bertiella* sp. from man (lateral view).
3. Longitudinal section of a mature segment of the same tapeworm just medial to the genital pore.
4. The same segment at the level of the seminal vesicle.
5. The same segment as the above but at the level of the ovary.
6. Ventral view of *Bertiella* sp. from man, reconstructed from sections.
7. Camera-lucida drawing of ovum of *Bertiella* sp. from man.

Plate 3

Fig. 1. Scolex of *Bertiella* sp. from monkey.
2. Camera-lucida drawing of a mature segment of *Bertiella* sp. from monkey (lateral view).
3. A transverse section of a mature segment of *Bertiella* sp. from monkey.
4. Another transverse section of a mature segment of *Bertiella* sp. from monkey.
5. Ovum of *Bertiella* sp. from monkey.

Plate 4

Fig. 1. Free-hand drawing of a mature segment of *Bertiella* sp. from dog (ventral view).
2. Camera-lucida drawing of a transverse section of a mature segment of *Bertiella* sp. from dog.



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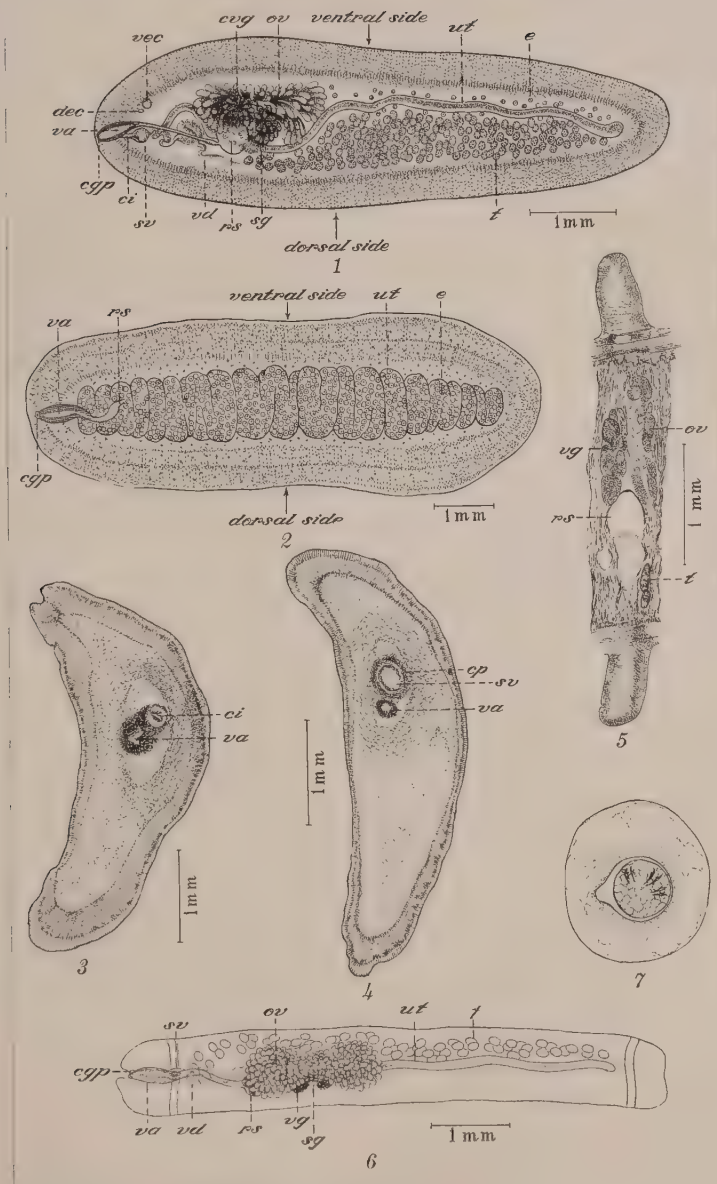
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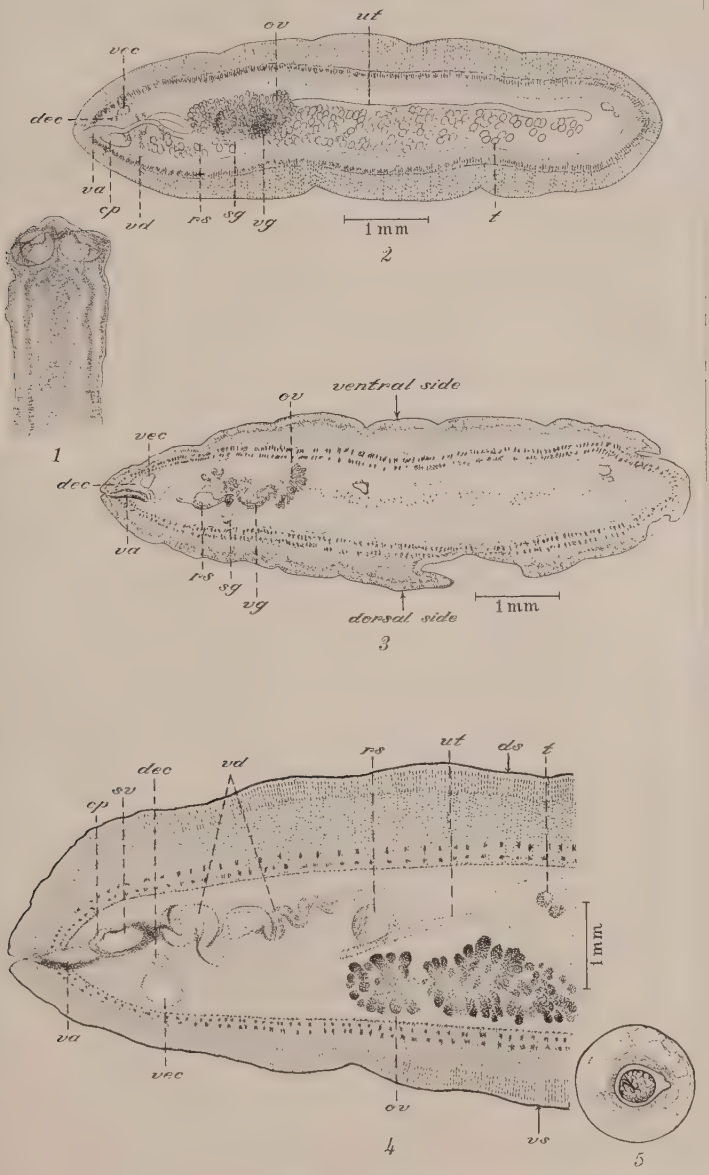
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PLATE 3.

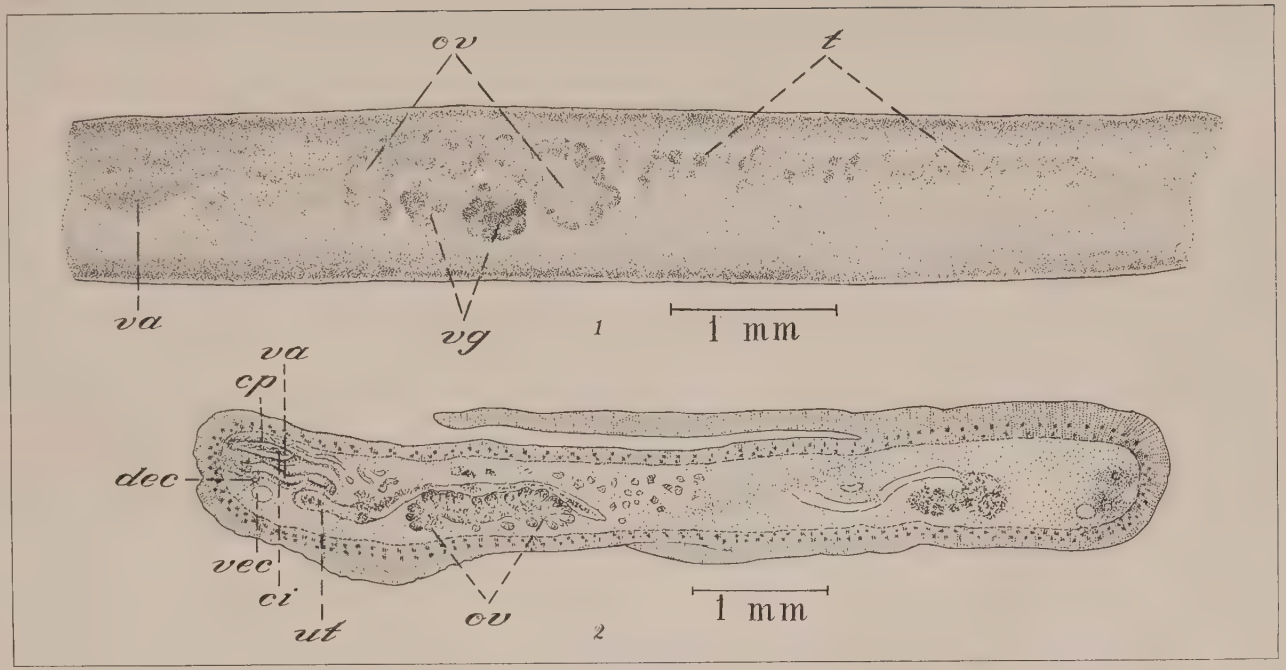

PLATE 4.

ADDITIONAL NOTES ON PHILIPPINE ACANTHOCEPHALA

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TWO PLATES

The four species of Acanthocephala described in this paper were collected from bird hosts by Messrs. A. Duyag and P. Rimando, to whom I wish to express my appreciation. Two of the parasites are represented by single specimens, for which reason it has proven difficult to make an accurate determination of their systematic affinities. For purposes of description they have been assigned to the genera *Oligoterorhynchus* Monticelli, 1914, and *Prosthorhynchus* Kostylev, 1916, as defined by Southwell and Macfie (1925).

Order ECHINORHYNCHATA

Family ECHINORHYNCHIDÆ Cobbold, 1879

POLYMORPHUS FRONTOSPINOSUS sp. nov. Plate 1, figs. 1 to 4.

Material.—Eight males and fourteen females, all mature, from the intestine of the common night heron, *Nycticorax nycticorax.*

This parasite was in the beginning thought to be identical with *Arhythmorhynchus hispidus* Van Cleave, 1925, a parasite of *Nycticorax nycticorax* in Japan, as described by Fukui (1929). Closer examination, however, revealed that it properly belongs to the genus *Polymorphus* Luehe, 1911, which, according to Travassos (1926), includes three species also parasitic in herons of the genus *Nycticorax.* It presents a great similarity to *Polymorphus mutabilis* (Rudolphi, 1819), from which it may be distinguished by the larger dimensions of its body and organs, the number of its proboscis hooks, and the uniform distribution of cuticular spines at the anterior region of its body.

Description.—Sexual dimorphism not strongly marked. Body more or less claviform, being swollen near anterior end and gradually tapering towards posterior extremity to a knoblike process which is especially noticeable in the female. Male meas-

ures 9.5 to 12.0 by 1.8 to 2.2 millimeters, female 12.5 to 15.0 by 2.0 to 2.5 millimeters. Cuticle from anterior end to posterior level of proboscis sheath in both sexes covered with numerous minute spines 10 to 12 microns long.

Proboscis subcylindrical, slightly swollen behind middle of its length, 0.70 to 0.80 by 0.25 to 0.32 millimeter in male and 0.80 to 0.92 by 0.30 to 0.34 millimeter in female. Except at its base, it is profusely covered with strong hooks arranged radially in eighteen to twenty alternating longitudinal rows of fourteen to fifteen hooks each. Hooks near middle of proboscis larger than those at anterior and posterior ends; they are 45.7 to 48.9 microns long and provided with rectangular roots 48.9 to 62.5 by 16.5 to 20.8 microns.

Neck absent.

Proboscis sheath double-walled, that of male measuring 1.28 to 1.90 by 0.28 to 0.50 millimeters and that of female 2.0 by 0.36 millimeters. Central nervous system immediately behind middle of length of proboscis sheath. Retinacula short, narrow.

Lemnisci slightly longer than, at most three-halves as long as, proboscis sheath. In male they barely reach the anterior level of the first testis.

Testes small, oval, very close together, one obliquely behind the other, at junction of first and second thirds of body length; they measure 0.42 to 0.90 by 0.36 to 0.70 millimeter. Prostatic glands tubular, six in number, compacted into an elongated mass 2.7 to 4.3 millimeters long. Cement reservoir 1.24 to 1.70 by 0.50 to 0.54 millimeters. Bursa relatively small.

Mature eggs in body cavity long, narrow, with three membranes, the middle one of which is thicker and with an outpocketing at each pole; they measure 104 to 120.6 by 29.1 to 33.3 microns.

Host.—*Nycticorax nycticorax.*

Location.—Intestine.

Locality.—Novaliches, Rizal, Luzon.

Type specimens.—Philippine Bureau of Science parasitological collection No. 300.

MEDIORHYNCHUS SIPOCOTENSIS sp. nov. Plate 2, figs. 1 and 2.

Material.—One adult male and one adult nongravid female.

This parasite fits well in the genus *Mediorhynchus* Van Cleave, 1916, as redefined by Travassos (1924). In so far as the arrangement of its proboscis hooks in longitudinal rows is concerned, its nearest ally known is *M. oswaldocruzi* Travassos, 1923.

It may be distinguished from the latter by its smaller body size, its larger proboscis hooks, and its shorter lemnisci.

Description.—Sexual dimorphism marked. Body flattened laterally, broadest near anterior end; posterior end in both sexes bluntly rounded. Cuticle slightly rugose and presenting indications of pseudosegmentation. Male 5.7 millimeters in length by 1.2 millimeters in maximum diameter, female 12.5 by 2.2 millimeters.

Proboscis cylindrical to subcylindrical, truncated anteriorly, measures 0.42 by 0.32 millimeter in male and 0.52 by 0.46 millimeter in female; it is armed with prominent hooks arranged in twenty alternating longitudinal series of five or six hooks each. The hooks protrude through the centers of papilliform projections, the presence of which give the surface of the proboscis a rugged appearance. In the male the hooks (lamina) are 50 to 62.5 microns long and have rectangular roots 50 to 58.2 by 16.5 to 18.7 microns; in the female the lamina of the hooks are 62.4 to 66.5 microns in length and the roots 54 to 62.5 by 16.5 to 20.8 microns.

Neck well defined and like that of the proboscis its surface is rugged due to the presence of papilliform tubercles, through the centers of which small hooks protrude; in the male it measures 0.24 by 0.32 millimeter and in the female 0.30 by 0.60 millimeter. The hooks are arranged irregularly in about forty longitudinal rows of five or six hooks each; they are without roots and in the male they measure about 20 microns and in the female 25 to 33.3 microns in length.

Proboscis sheath poorly developed, single-walled, measures 1.04 by 0.35 millimeters in male and 3.03 by 0.82 millimeters in female. Central nervous system in middle of length of proboscis sheath.

Lemnisci of male 3.9 millimeters long by 0.2 millimeter in maximum diameter, those of female 6.2 by 0.2 millimeters.

Testes oval, tandem, partly overlapping, in third fourth of body length; anterior testis 0.98 by 0.38, posterior testis 0.76 by 0.42 millimeter. Prostatic glands eight in number, roundish, 0.10 to 0.12 millimeter in diameter, immediately behind testes. Cement reservoir 0.34 by 0.28 millimeter. Bursa small, invaginated.

Body cavity of female devoid of ova.

Host.—*Penelopides manillæ.*

Location.—Intestine.

Locality.—Sipocot, Camarines Sur, Luzon.

Type specimens.—Philippine Bureau of Science parasitological collection No. 332.

PROSTHORHYNCHUS PITTARUM sp. nov. Plate 2, figs. 3 and 4.

Material.—One adult female.

Description.—Body plump, tapering towards both extremities, about 10 millimeters in length by 2 millimeters in maximum diameter; posterior end rounded, slightly curved ventrally. Cuticle unarmed.

Proboscis cylindrical, rounded at anterior end, 0.75 by 0.20 millimeter, armed with fourteen longitudinal rows of fifteen hooks each. Hooks 54 to 58 microns long and provided with roots 41 to 45 microns long.

Neck short, 0.12 millimeter long, unarmed.

Proboscis sheath with double walls, 1.6 by 0.4 millimeters. Central nervous system not evident.

Lemnisci narrow, 1.95 millimeters long.

Body cavity filled with numerous eggs, the apparently mature ones provided with three concentric membranes and measuring 125 to 130 by 45 to 50 microns. Genital opening ventrosubterminal at posterior end.

Host.—Pitta atricapilla.

Location.—Intestine.

Locality.—Novaliches, Rizal, Luzon.

Type specimen.—Philippine Bureau of Science parasitological collection No. 384.

OLIGOTERORHYNCHUS MALAYENSIS sp. nov. Plate 2, fig. 5.

Material.—One adult male.

Description.—Body quite slender, cylindrical, about 10.5 by 0.9 millimeters; posterior end bluntly conical. Cuticle smooth.

Proboscis subcylindrical, rounded at anterior end, 1.1 by 0.22 millimeters; base unarmed, the rest of its surface profusely covered with prominent hooks arranged radially in eighteen longitudinal series of twenty-one hooks each. Hooks on extreme anterior and posterior ends of proboscis smaller, with reduced roots, and 33.3 to 41.5 microns long; rest of hooks 41.5 to 49.5 microns long and with well-developed roots 37.5 to 41.6 by 16.5 microns.

Neck absent.

Proboscis sheath double-walled, 1.84 by 0.35 millimeters. Central nervous system in front of middle of length of proboscis sheath. Retinacula narrow, short.

Lemnisci narrow, 2.3 millimeters long.

Testes oval, one immediately behind the other, in middle of body length; first testis 0.85 by 0.40, second testis 0.88 by 0.36 millimeter. Prostatic glands four in number, tubular, forming a bundle 2.7 millimeters long. Cement reservoir 1.3 by 0.35 millimeters. Bursa well developed, about 1 millimeter across, arising from ventral aspect of posterior end of body.

Host.—*Hypotænidia philippensis.*

Location.—Intestine.

Locality.—Novaliches, Rizal, Luzon.

Type specimen.—Philippine Bureau of Science parasitological collection No. 380.

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ILLUSTRATIONS

[Drawn by Alfredo C. Gonzales.]

PLATE 1

POLYMORPHUS FRONTOSPINOSUS SP. NOV.

FIG. 1. Male, ventrolateral view.
2. Female, ventrolateral view.
3. Proboscis hooks.
4. Mature egg.

PLATE 2

FIG. 1. *Mediorhynchus sipocotensis* sp. nov.; male, lateral view.
2. *Mediorhynchus sipocotensis* sp. nov.; proboscis of female, lateral view.
3. *Prosthorhynchus pittarum* sp. nov.; female, lateral view.
4. Egg of *Prosthorhynchus pittarum* sp. nov.
5. *Oligoterorhynchus malayensis* sp. nov.; male, lateral view.

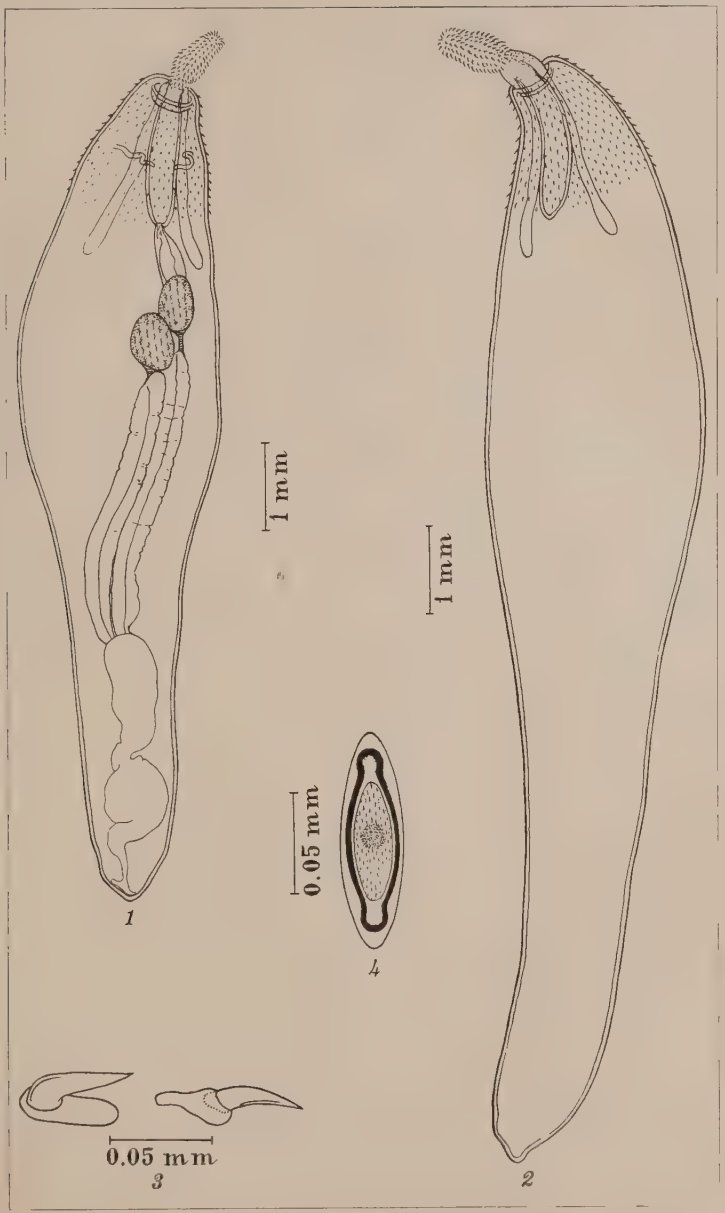

PLATE 1.

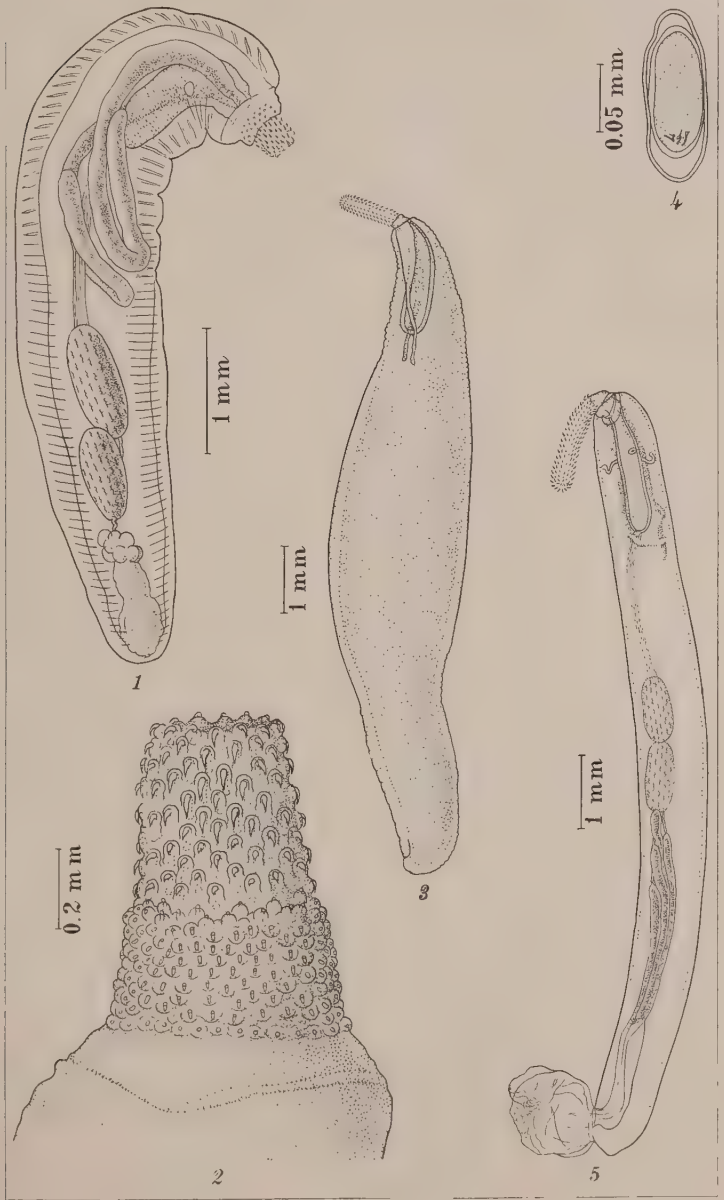

PLATE 2.

STUDIES ON THE DIASTOLIC BLOOD PRESSURE IN BERIBERI CASES ADMITTED TO THE PHILIPPINE GENERAL HOSPITAL DURING THE YEARS 1932–1934.

By Kouhei Sugino

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INTRODUCTION

It is a well-known fact that beriberi occurs in rice eaters and is the result of some deficiency in the diet; namely, lack of vitamin B.

Judging from the report of the Bureau of Health, beriberi is a great public-health problem in the Philippine Islands, for although it is decreasing in Manila, it is increasing in the provinces, so that the total number of cases increases every year.

By courtesy of Prof. Luis Guerrero I was able to examine a few cases of beriberi confined in the Philippine General Hospital. It was found that the diastolic blood pressure in these cases was high compared with that observed in cases of beriberi in Japan, and the question arose whether or not race, climate, and food might explain this apparent difference. An examination was therefore undertaken of the clinical case records of beriberi cases admitted to the Philippine General Hospital during the period from May, 1932, to June, 1934, in order to determine if there actually existed any difference between the diastolic blood pressure of beriberic Filipinos and beriberic Japanese.

SYMPTOMATOLOGY

Beriberi is a composite of many symptoms, such as palpitation, œdema, digestive, sensory, and motor disturbances, etc., and recently Z. Shimazono(1) and K. Omori(2) have reported on the lowering of the diastolic blood pressure in beriberi compared with the normal average. This lowering, according to these authors, is also observed in experimental beriberi in human beings. Shimazono(1) states that this characteristic symptom is observed even in incipient cases of beriberi.

It has been found that the cause of this lowering of the diastolic blood pressure is a weakening of the arterial tension, and

does not depend upon a diminution in the blood quantity. It has also been observed that the tension of the heart and the peripheral vascular system is always more or less depressed in cases of beriberi.

Table 1, from a case reported by Shimazono, shows the lowering of the diastolic blood pressure in beriberi.

TABLE 1.—*Blood pressure of M. N., student, age 21 years (by Riva-Rocci).*

Date.	Systolic.	Diastolic.	Condition.
	mm Hg.	*mm Hg.*	
September 4	98	0	Very serious.
September 5	98–100	0	
September 7	125	0	Better.
September 10	126	85	Fair.
September 18	125	0	
September 21	122	0	
September 25	140	45	
September 30	151	47	
October 5	152	67	Very well.

In the systolic blood pressure beriberi causes no remarkable change. However, in serious cases a lowering of the systolic blood pressure may be observed, which becomes a fatal omen when it drops to 80 or 70 millimeters of mercury, according to Riva-Rocci. In some cases recovery from beriberi is associated with an increase in blood pressure above normal, reaching 150 or 160 millimeters of mercury even in young individuals, but returning gradually to normal upon recovery of the patient, as in the case by Shimazono (Table 1).

On the blood pressure in beriberi, especially the diastolic blood pressure, nothing has been written in the Philippines where beriberi is very prevalent. Therefore, it would be interesting and pertinent to investigate this problem.

STATISTICS

Much work has been done in the study of blood pressure among Filipinos. However, no author except Concepción(3) has reported anything on the diastolic blood pressure. His work has, therefore, proved invaluable to me, supplying me with the very much needed standard basis of comparison of diastolic blood pressure in Filipinos.

Following Concepción's classification,(3) I have divided my cases into eight groups by age and compared the diastolic blood pressure of beriberi with that of average normal readings.

Ninety-eight cases of beriberi were admitted to the Philippine General Hospital during the period from May, 1932, to June, 1934, of which forty-one, or 42 per cent were males, and fifty-seven, or 48 per cent, females.

Table 2 shows the incidence of beriberi according to decades of age, except for the cases between 15 and 20 years of age, studied by Concepción.

The incidence of beriberi is highest in individuals 21 to 30 years of age, especially females. Next in order come cases occurring in young people between 15 and 20 years of age, after which the tendency decreases with age. Beriberi is a disease that, like tuberculosis, is easily contracted by young adults between the ages of 21 to 30 years.

TABLE 2.—*Incidence of beriberi by age and sex.*

Age in years.	Males.		Age in years.	Females.	
	Cases.	Per cent.		Cases.	Per cent.
15–20	9	22.0	15–20	8	14.0
21–30	11	26.8	21–30	29	51.0
31–40	7	17.0	31–40	8	14.0
41–50	8	19.5	41–60	12	21.0
51–60	2	4.9			
61–90	4	9.8			
Total	41		Total	57	

Tables 3 and 4 show the relation between the diastolic blood pressure of the beriberi cases that I have collected and the corresponding normal average readings as reported by Concepción.(3)

Only two male and six female beriberi cases show higher diastolic blood pressures than the normal diastolic blood pressures reported by Concepción. In all other beriberi cases the diastolic blood pressure was always below the normal average. These findings agree with those of Shimazono and show that race, climate, and food, which on first sight seemed to exert some influence, actually have no effect. The average diastolic blood pressure observed in beriberi cases in the Philippines is the

same as that observed in beriberi cases occurring in Japanese in Japan. In the eight cases above showing diastolic blood pressure higher than normal, the systolic blood pressure was likewise remarkably higher than normal (Tables 3 and 4).

TABLE 3.—*Blood pressure in normal and in beriberic male Filipinos.*

Age in years.	Systolic.		Diastolic.	
	Concepción's readings, normal.	Beriberic.	Concepción's readings, normal.	Beriberic.
		mm Hg.		*mm Hg.*
15–20	110.7	118.0 115.0 110.0 96.0 119.0 97.0 96.0 105.0 100.0	77.6	70.0 80.0 80.0 50.0 50.0 60.0 71.0 80.0 50.0
21–30	111.9	90.0 118.0 112.0 [b] 132.0 106.0 108.0 120.0 110.0 108.0 120.0 118.0	76.6	50.0 58.0 60.0 [b] 100.0 58.0 66.0 64.0 52.0 60.0 55.0 80.0
31–40	118.8	118.0 110.0 122.0 115.0 100.0 [b] 140.0 85.0	80.3	70.0 68.0 78.0 72.0 65.0 [b] 95.0 42.0
41–50	125.4	115.0 114.0 122.0 (a) 100.0 124.0 114.0 118.0	86.6	70.0 80.0 82.0 (a) 60.0 50.0 58.0 80.0
51–60	129.0	135.0 130.0	86.2	80.0 50.0
61–90	137.8	125.0 140.0 95.0 170.0	91.6	70.0 90.0 62.0 90.0

[a] No record. [b] Much higher than that of Concepción.

TABLE 4.—*Blood pressure in normal and in beriberic female Filipinos.*

Age in years.	Systolic.		Diastolic.	
	Concepción's readings, normal.	Beriberic.	Concepción's readings, normal.	Beriberic.
		mm Hg.		*mm Hg.*
15–20	109.2	110.0	80.8	46.0
		[b] 140.0		[b] 88.0
		114.0		68.0
		110.0		70.0
		95.0		70.0
		110.0		80.0
		105.0		70.0
		98.0		60.0
21–30	118.1	110.0	84.1	68.0
		110.0		70.0
		98.0		60.0
		114.0		70.0
		[b] 135.0		[b] 90.0
		[b] 142.0		[b] 96.0
		112.0		70.0
		128.0		80.0
		115.0		60.0
		[b] 140.0		[b] 100.0
		112.0		80.0
		98.0		70.0
		120.0		54.0
		110.0		68.0
		104.0		86.0
		80.0		40.0
		108.0		68.0
		100.0		60.0
		[b] 152.0		[b] 92.0
		94.0		52.0
		110.0		70.0
		110.0		75.0
		150.0		85.0
		115.0		70.0
		130.0		84.0
		110.0		88.0
		[a]		[a]
		[b] 150.0		[b] 95.0
		105.0		65.0
31–40	118.2	118.0	85.1	70.0
		108.0		78.0
		145.0		82.0
		130.0		85.0
		125.0		45.0
		100.0		62.0
		134.0		76.0
		113.0		70.0

[a] No record. [b] Much higher than that of Concepción.

TABLE 4.—*Blood pressure in normal and in beriberic female Filipinos*—Ctd.

Age in years.	Systolic.		Diastolic.	
	Concepción's readings, normal.	Beriberic.	Concepción's readings, normal.	Beriberic.
		mm Hg.		*mm Hg.*
41–60	132.9	120.0	90.5	60.0
		78.0		30.0
		138.0		85.0
		110.0		62.0
		128.0		82.0
		98.0		52.0
		135.0		80.0
		104.0		62.0
		120.0		60.0
		140.0		80.0
		146.0		64.0
		100.0		70.0

Tables 3 and 4 show that the difference between the systolic blood pressure of the above-excepted eight beriberi cases and the corresponding normal systolic average is greater than the difference existing between the diastolic blood pressure of these eight cases and the corresponding normal diastolic average given by Concepción, which further shows that there actually occurs an absolute lowering of the diastolic blood pressure in beriberi.

SUMMARY

1. The incidence of beriberi is highest in individuals ranging from 21 to 30 years of age, especially females, followed closely by young adults of 15 to 20 years. With advancing age there is a tendency for beriberi to decrease.

2. The diastolic blood pressure in beriberi is lower than the normal average diastolic blood pressure at a given age.

3. When the systolic blood pressure is higher than normal in beriberi, the lowering of the diastolic blood pressure is not evident.

ACKNOWLEDGMENT

In conclusion I wish to express my obligation to Prof. L. Guerrero, of the Philippine General Hospital, and Dr. M. Tubangui, of the Bureau of Science, for permission to carry on these studies.

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THE ATYIDÆ OF THE PHILIPPINE ISLANDS

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THREE PLATES

Fresh-water units of the Philippine Islands are generally richly inhabited by small prawns locally called *apta, yapyap* (Tagalog), *daliw-daliw,* or *koros* (Ilocano). These prawns belong to the family Atyidæ. They are abundant in large fresh-water lakes, especially Laguna de Bay and Taal Lake, where they are caught in large quantities by means of scissors-nets, such as the *salap* and *sakág.*

This crustacean is eaten fresh, or salted and made into a fermented product called *alamang.* It is also simply dried and sold as dry prawn. When the supply is abundant, it is prepared as protein feed for ducks and chickens or converted into some form of fertilizer. The local price of this product varies from 1 peso (50 cents United States currency) to 2.50 pesos a cavan.[1]

Although these prawns are widely distributed in the Tropics and Subtropics, very little has been written on their distribution and systematics in the Philippines. R. P. Cowles, formerly of the Department of Zoölogy, College of Liberal Arts, University of the Philippines, described the feeding habits of *Atya moluccensis* de Haan, so far the only described species in the Philippines. He indicated that there are several undescribed species of *Caridina,* which have feeding habits more or less similar to those of *Atya moluccensis.*

ATYIDÆ

In general, the first and second pairs of legs in the Atyidæ are comparatively small and of similar size. The chelæ are each fringed with a brush of long hairs. The family is represented in the Philippine Islands by *Atya, Caridina,* and *Ortmania,* which are believed to be more specialized than genera occurring in other countries.

[1] A cavan is 25 gantas. A ganta is equivalent to 3 liters or 3.3036 quarts.

The family Atyidæ is represented in the collection of the Bureau of Science by the following:

Atya moluccensis de Haan.
Atya serrata Spence Bate.
Caridina gracillima Lanchester.
Caridina gracilirostris de Man.
Caridina nilotica var. *brachydactyla* de Man.
Caridina modigliani Nobili.
Caridina brevicarpalis var. *endehensis* de Man.
Caridina laevis Heller.
Ortmania sp. (?).

Genus ATYA Leach

Atya Leach, Trans. Linn. Soc. London 11 (1815) 345.

Pairs of chelipeds quite similar; carpus reduced by the excavation of its distal border to a narrow crescent form; propodus modified, dactylus markedly developed so that the "palm" is entirely absent; chela composed of two similar parts.

Key to the known species of Atya in the Philippines.

a^1. Infraorbital and pterygostimal angles of anterior carapace prolonged to a point..... ***A. moluccensis* de Haan.**

a^2. Infraorbital and pterygostimal angles of anterior carapace not long and pointed ..... ***A. serrata* Spence Bate.**

ATYA MOLUCCENSIS de Haan.

Atya moluccensis de Haan, Fauna Japonica, Crustacea (1849) 184–186, pl. 21; Miers, Ann. & Mag. Nat. Hist. (V) 5 (1880) 42, pl. 15, figs. 3 and 4; de Man, Zool. Ergeb. (1892) 357, pl. 21, fig. 20; Ortman, Denk. Ges. Jena 8 (1894) 1–80, pls. 1–13; Proc. Acad. Nat. Sci. Phila. (1895) 408; de Man, Abh. Senck. Naturf. Ges. 138 (1904) 137.

Atya armata Milne-Edwards, Ann. Soc. Ent. de France (1864) 149, pl. 3, fig. 3; von Martens, Arch. Naturg. Jahrg. 47 (1868) 47, pl. 1, fig. 6.

Atya gustavi Ortman, Zool. Jahrb. Syst. 5 (1890) 467, pl. 36, figs. a, b, c.

Atya dentirostris Thallwitz, Abh. Ber. K. Zool. Anthr. ethn. Mus. Dresden (1891) 26, fig. 7.

Rostrum short, narrow, slenderly excavated at broad side of dorsal part and armed with numerous little teeth on ventral keel. Infraorbital and pterygostimal angles prolonged to a point. "Immobile" and "mobile" fingers of first and second peræopods alike in shape and size. Excavation of distal borders of carpus crescent-shaped.

Three adult specimens, 35 to 39 millimeters long.

NEGROS, Oriental Negros Province, Dumaguete River, March 8, 1922.

ATYA SERRATA Spence Bate. Plate 1, figs. 1 to 4.

Atya serrata Spence Bate, Challenger Rept. Zool. 24 (1888) 669, pl. 119, fig. 2; Ortman, Proc. Acad. Nat. Sci. Phila. (1895) 410; Bouvier, C. R. Acad. Sci. 138 (1904) 446; Bordage, C. R. Acad. Sci. 147 (1908) 1418, fig. 1; 148 (1909) 47; Calman, Quart. Journ. Micr. Sci. 55 (1910) 792; Bouvier, C. R. Acad. Sci. 152 (1911) 1822; 154 (1912) 692, figs. 4, 6, 7; Trans. Linn. Soc. London (II) 15 (1913) 460; C. R. Acad. Sci. 159 (1914) 700; Bouvier and d'Emmeres de Charmoy, C. R. Acad. Sci. 169 (1919) 317.

Ortmania alluaudi mutation *serrata* Bouvier, Bull. Scient. de Fr. et Belg. 39 (1905) 106, 115, fig. 19.

Atya brevirostris de Man, Zool. Ergeb. 2 (1892) 360, pl. 21, fig. 21; Ortman, Denk. Ges. Jena 8 (1894) 10; Ortman, Proc. Acad. Nat. Sci. Phila. (1895) 409; Schenkel, Verh. Naturf. Ges. Basel 13 (1902) 500, fig. 6; Bouvier, Bull. du Mus. (1904) 137.

Atya breverostris var. *de mani* Nobili, Ann. Mus. Civ. dei Storia Nat. Genova (II) 20 (1900) 475.

Atyoida tahitensis Stimpson, Proc. Acad. Nat. Sci. Phila. (1860) 97.

Infraorbital and pterygostimal angles of anterior part of carapace very short and pointed. Short rostrum not extending beyond second segment of antennular peduncle, curved downwards, ventrally forming a keel. Formula of rostral teeth $\frac{0}{5}$. "Immobile" and "mobile" fingers alike in shape and size in both first and second peræopods. Excavations of carpus of their distal borders, crescent-shaped. Apex of telson semicircular, possessing two externolateral spines and two internolateral spines.

Several specimens, 18 to 29 millimeters long.

LUZON, Ilocos Norte Province, Laoag River, February 5, 1934.

Genus CARIDINA Milne-Edwards

Caridina Milne-Edwards, Histoire naturelle des Crustaces 2 (1837).

Chelæ not very variable; dactylus or "movable finger" opposed to "immobile finger" or propodus; carpus of first pair short and broad, its distal margin more or less concave; propodus articulating with lower corner of carpus; carpus of second pair more or less elongated and slender; propodus articulating with its distal end.

Key to the known species of Caridina in the Philippines.

a[1]. Rostrum long, curving upward towards tip; end bifid or trifid.

b[1]. Number of teeth of upper and lower borders of rostrum $\frac{19}{16}$.

C. gracillima Lanchester.

b^2. Number of teeth of upper and lower borders of rostrum varying between $\frac{6-9}{17-27}$ ..... *C. gracilirostris* de Man.

b^3. Number of teeth of upper and lower borders of rostrum varying from $\frac{13-24}{11-16}$ ..... *C. modigliani* Nobili.

b^4. Number of teeth of upper and lower borders of rostrum varying from $\frac{11-23}{18-19}$ ..... *C. brevicarpalis* var. *endehensis* de Man.

a^2. Rostrum short, not extending beyond antennal scale.

b^1. Number of teeth of upper and lower border of rostrum $\frac{21}{13}$; end trifid..... *C. nilotica* var. *endehensis* de Man.

b^2. Number of teeth of upper and lower borders of rostrum varying from $\frac{15-19}{2-6}$ ..... *C. lævis* Heller.

CARDINA GRACILLIMA Lanchester. Plate 1, figs. 5 to 10.

Caridina gracillima Lanchester, Proc. Zool. Soc. London (1901) 560–563, pl. 34, fig. 1; Bouvier, Bull. Scient. de Fr. et Belg. 39 (1905) 72; C. R. Acad. Sci. 154 (1912) 918; Trans. Linn. Soc. London (II) 15 (1913) 463; Kemp, Mem. Asiat. Soc. Bengal 6 (1918) 285.

Rostral formula $\frac{19}{15}$; 19 teeth present on upper edge; lower edge bearing 15 teeth. Rostrum long, curving upwardly beyond antennal scale. Toothed part of upper edge, one-half less than total length. Carpus of first leg, twice as long as broad; that of second $4\frac{3}{4}$ times as long as broad. Dactylus of third pair with 10 spines; that of fifth pair, 60 spines. Uropods each with 12 spines.

A single female specimen, 34 millimeters long.

LUZON, Ilocos Norte Province, Laoag, Caaoacan River, August 14, 1933.

CARIDINA GRACILIROSTRIS de Man. Plate 2, figs. 11 to 17.

Caridina gracilirostris de Man, Zool. Ergeb. (1892) 399, pl. 25, fig 31; Zool. Jahrb, Syst. 9 (1897) 726; Nobili, Ann. Mus. Civ. St. Nat. Genova II 20 (1900) 477; J. Roux, Revue suisse de Zool. 12 (1804) 555; Bouvier, Bull. Scient. de Fr. et Belg. 39 (1905) 72; Trans. Linn. Soc. London II 15 (1913) 463; Kemp, Mem. Asiat. Soc. Bengal 6 (1818) 282.

Rostrum very long, extending beyond antennal scale. Tooth formula $\frac{(6-9)\pm1}{17-27}$; upper edge armed with 6 to 9 teeth, two of them on carapace, in addition to a subapical tooth; lower edge with from 17 to 27 teeth. Toothed part of upper edge one-fourth less than length of unarmed part.

TABLE 1.—*Length and rostral formula of young Caridina gracilirostris de Man.*

Specimen—	Length.	Rostral formula.	Specimen—	Length.	Rostral formula.
	mm.			*mm.*	
1	25	$\frac{8+1}{19}$	11	25	$\frac{8+1}{21}$
2	24	$\frac{8+1}{20}$	12	27	$\frac{7+1}{21}$
3	23	$\frac{8+1}{19}$	13	20	$\frac{8+1}{25}$
4	22	$\frac{8+1}{20}$	14	24	$\frac{7+1}{20}$
5	22	$\frac{7+1}{17}$	15	25	$\frac{8+1}{17}$
6	21	$\frac{7+1}{21}$	16	21	$\frac{8+1}{21}$
7	22	$\frac{8+1}{23}$	17	22	$\frac{9+1}{27}$
8	20	$\frac{8+1}{21}$	18	22	$\frac{7+1}{27}$
9	21	$\frac{7+1}{21}$	19	21	$\frac{8+1}{21}$
10	20	$\frac{6+1}{19}$			

Carpus of first leg $1\frac{3}{4}$ times as long as broad. Dactylus of third pair with 12 spines; that of fifth pair, 50 spines. Terminal joints of third maxilliped with 17 spines. Uropods each with 9 spines.

Nineteen young specimens, 20 to 37 millimeters long (Table 1). LUZON, Laguna de Bay, November, 1929.

CARIDINA NILOTICA var. BRACHYDACTYLA de Man. Plate 2, fig. 18.

Caridina wyckii de Man, Zool. Ergeb. (1892) 386–393, pl. 24, fig. 29, cc, dd, f, g, i, ii, k.

Caridina wyckii var. *paucipara* Bouvier, Bull. Scient. de Fr. et Belg. 39 (1905) 79.

Caridina nilotica var. *brachydactyla* de Man, Rec. Ind. Mus. 2 (1908) 269, pl. 20, fig. 8.

Caridina brachydactyla Bouvier, Trans. Linn. Soc. London II 15 (1913) 463.

Caridina brachydactyla subsp. *peninsularis* Kemp, Mem. Asiat. Soc. Bengal 6 (1918) 270, fig. 10.

Rostral formula $\frac{31}{13}$; 31 teeth present on almost entire length of upper edge; 5 teeth on carapace; that of lower edge with 13

teeth; its end trifid. Rostrum short, extending a little beyond antennal scale.

Fingers of first pair 2 to 2.5 times as long as palm. Carpus of second pair of legs very slender; 6 times as long as broad distally.

Eggs very numerous and small, 0.39 to 0.44 millimeter long and 0.22 to 0.25 millimeter wide.

A single sexually mature specimen, 27 millimeters long.

LUZON, Ilocos Norte Province, Laoag, Caaoacan River, August 14, 1933.

CARIDINA MODIGLIANI Nobili. Plate 2, figs. 19 to 24.

Caridina modigliani Nobili, Ann. Mus. Civ. Stor. Nat. Genova 20 (1900) 477; Bouvier, Bull. Scient. de Fr. et Belg. 39 (1905) 72.

Rostrum slender, curving upwardly towards the tip; very long, without spines on almost half of its distal length. Rostral formula $\frac{(13–24)\pm 2–3}{11–16}$; 13 to 24 teeth on the upper margin of the rostrum, 2 of them on the carapace; that of the lower margin with 11 to 16 teeth; its end bifid or trifid.

Carpus of the first peræopod, $1\frac{3}{4}$ times as long as broad; that of the second $5\frac{1}{3}$ times as long as broad.

Forty-one adult specimens, 23 to 34 millimeters long (Table 2).

LUZON, Ilocos Norte Province, Laoag, Laoag River.

CARIDINA BREVICARPALIS var. ENDEHENSIS de Man. Plate 2, fig. 25.

Caridina brevicarpalis var. *endehensis* de Man, Zool. Niederlandisch Ost. Indien (1892) 399, pl. 24, figs. 30c and 30e.

Rostral formula of two specimens $\frac{11 \text{ and } 23}{18 \qquad 19}$, approaching rostral formula of $\frac{11–20}{14–20}$ given by de Man. Rostrum long, extending beyond antennal scale.

Four mature females, 25 to 29 millimeters long.

LUZON, Batangas Province, Pancipit River, April 19, 1934.

CARIDINA LÆVIS Heller. Plate 3, figs. 26 to 32.

Caridina lævis Heller, Verh. Zool. bot. Ges. Wien. 12 (1862) 411; de Man, Zool. Ergeb. (1892) 376, pl. 22, fig. 27; de Man, Rec. Ind. Mus. 2 (1908) 253, pl. 20; Ortman, Proc. Acad. Nat. Sci. Phila. (1895) 404; Bouvier, Bull. du Mus. (1904) 131; Bouvier, Trans. Linn. Soc. London II 15 (1913) 464; Kemp, Mem. Asiat. Soc. Bengal 6 (1819) 289.

Rostral formula $\frac{15-19}{2-6}$; upper margin of rostrum with 15 to 19 teeth, 2 to 5 located on carapace; lower margin with from 2 to 6 teeth; rostrum short, not extending beyond antennal scale.

TABLE 2.—*Length and rostral formula of female Caridina modigliani Nobili.*

Specimen—	Length.	Rostral formula.	Specimen—	Length.	Rostral formula.
	mm.			mm.	
1	31	$\frac{19+2}{15}$	22	29	$\frac{21+2}{18}$
2	28	$\frac{17+2}{14}$	23	32	$\frac{15+2}{12}$
3	25	$\frac{16+2}{15}$	24	29	$\frac{17+2}{15}$
4	27	$\frac{18+2}{13}$	25	30	$\frac{17+2}{15}$
5	30	$\frac{14+2}{15}$	26	24	$\frac{15+2}{15}$
6	29	$\frac{14+2}{18}$	27	25	$\frac{19+2}{16}$
7	23	$\frac{20+2}{16}$	28	29	$\frac{13+2}{13}$
8	27	$\frac{18+2}{16}$	29	28	$\frac{20+2}{14}$
9	31	$\frac{19+2}{16}$	30	26	$\frac{22+2}{15}$
10	31	$\frac{21+2}{17}$	31	27	$\frac{17+2}{15}$
11	32	$\frac{17+2}{19}$	32	30	$\frac{19+2}{15}$
12	26	$\frac{18+2}{14}$	33	32	$\frac{17+2}{14}$
13	27	$\frac{17+2}{14}$	34	31	$\frac{22+2}{17}$
14	27	$\frac{16+2}{14}$	35	33	$\frac{17+2}{20}$
15	26	$\frac{18-2}{14}$	36	29	$\frac{17+2}{15}$
16	26	$\frac{14+2}{11}$	37	27	$\frac{18+3}{12}$
17	27	$\frac{11+2}{16}$	38	26	$\frac{12+3}{17}$
18	23	$\frac{15+2}{12}$	39	25	$\frac{17+3}{15}$
19	29	$\frac{16+2}{15}$	40	34	$\frac{18+3}{16}$
20	26	$\frac{14+2}{14}$	41	27	$\frac{19+3}{14}$
21	28	$\frac{17+2}{15}$			

Fifteen young specimens, 15 to 19 millimeters long (Table 3). LUZON, Albay Province, Pulangue Lake, January 26, 1926.

TABLE 3.—*Length and rostral formula of Caridina lævis Heller.*

Specimen—	Length.	Rostral formula.	Specimen—	Length.	Rostral formula.
	mm.			*mm.*	
1	16	$\frac{18}{6}$	9	18	$\frac{19}{6}$
2	19	$\frac{18}{6}$	10	15	$\frac{19}{5}$
3	18	$\frac{17}{4}$	11	17	$\frac{16}{6}$
4	18	$\frac{15}{4}$	12	16	$\frac{16}{6}$
5	17	$\frac{19}{5}$	13	18	$\frac{15}{4}$
6	16	$\frac{17}{5}$	14	17	$\frac{18}{2}$
7	19	$\frac{17}{5}$	15	16	$\frac{17}{4}$
8	18	$\frac{17}{6}$			

Genus ORTMANIA Rathbun

Ortmania Rathbun, U. S. Fish. Comm. 2 (1910) 120.

Carpus of first pair of legs similar to that of second pair, being short and broad, distal margin excavated and articulating with propodus of lower corner. Some species of *Ortmania* have second carpus similar to that in *Caridina*, by being somewhat longer than the first; excavation of distal margin shallow. Some with carpus nearly similar in the two pairs, and deeply excavated to assume a crescentic form as in *Atya*. In some species chelæ quite similar to those of *Caridina*, in others "palm" much shortened, with articulation of "movable finger" carried backwards towards base of propodus.

ORTMANIA sp. (?). Plate 3, figs. 33 to 40.

Rostrum short, not extending beyond antennal scale. Rostral toothing $\frac{0}{3}$; no teeth on upper edge, and 3 teeth at lower edge. Shape of rostrum similar to that of *O. mexicana* de Saussure. Segments of antennular peduncle with numerous spines.

First peræopod similar in shape to that of *Atya*. Dactylus of third pair of legs with 4 spines; that of fifth pair with 20 spines. Apex of telson similar to that of *O. alluaudi* Bouvier. One of the uropods with 15 spines.

A single young specimen, 14 millimeters long.

LUZON, Ilocos Norte Province, Laoag, Caaoacan River, August 14, 1933.

This specimen is probably a variety of *O. mexicana* de Saussure, if the character of the rostrum is taken as a basis for classification, but due to lack of material I hesitate to assign it to *O. mexicana.*

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ILLUSTRATIONS

Plate 1

Fig. 1. *Atya serrata*, anterior cephalothorax.
2. *Atya serrata*, peræopod of first pair.
3. *Atya serrata*, peræopod of second pair.
4. *Atya serrata*, apex of telson.
5. *Caridina gracillima*, rostrum.
6. *Caridina gracillima*, peræopod of first pair.
7. *Caridina gracillima*, peræopod of second pair.
8. *Caridina gracillima*, dactylus of third pair.
9. *Caridina gracillima*, dactylus of fifth pair.
10. *Caridina gracillima*, uropodial spines.

Plate 2

Fig. 11. *Caridina gracilirostris*, rostrum.
12. *Caridina gracilirostris* peræopod of first pair.
13. *Caridina gracilirostris*, peræopod of second pair.
14. *Caridina gracilirostris*, dactylus of third pair.
15. *Caridina gracilirostris*, dactylus of fifth pair.
16. *Caridina gracilirostris*, terminal joint of third maxilliped.
17. *Caridina gracilirostris*, uropodial spines.
18. *Caridina nilotica* var. *brachydactyla*, rostrum.
19. *Caridina modigliani*, rostrum.
20. *Caridina modigliani*, peræopod of first pair.
21. *Caridina modigliani*, peræopod of second pair.
22. *Caridina modigliani*, dactylus of third pair.
23. *Caridina modigliani*, uropodial spines.
24. *Caridina modigliani*, apex of telson.
25. *Caridina brevicarpalis* var. *endehensis*, rostrum.

Plate 3

Fig. 26. *Caridina laevis*, rostrum.
27. *Caridina laevis*, peræopod of first pair.
28. *Caridina laevis*, peræopod of second pair.
29. *Caridina laevis*, dactylus of third pair.
30. *Caridina laevis*, terminal joint of third maxilliped.
31. *Caridina laevis*, uropodial spines.
32. *Caridina laevis*, apex of telson.
33. *Ortmania* sp?, rostrum.
34. *Ortmania* sp?, antennal scale.
35. *Ortmania* sp?, antennule.
36. *Ortmania* sp?, peræopod of first pair.
37. *Ortmania* sp?, dactylus of third pair.
38. *Ortmania* sp?, dactylus of fifth pair.
39. *Ortmania* sp?, uropodial spines.
40. *Ortmania* sp?, apex of telson.

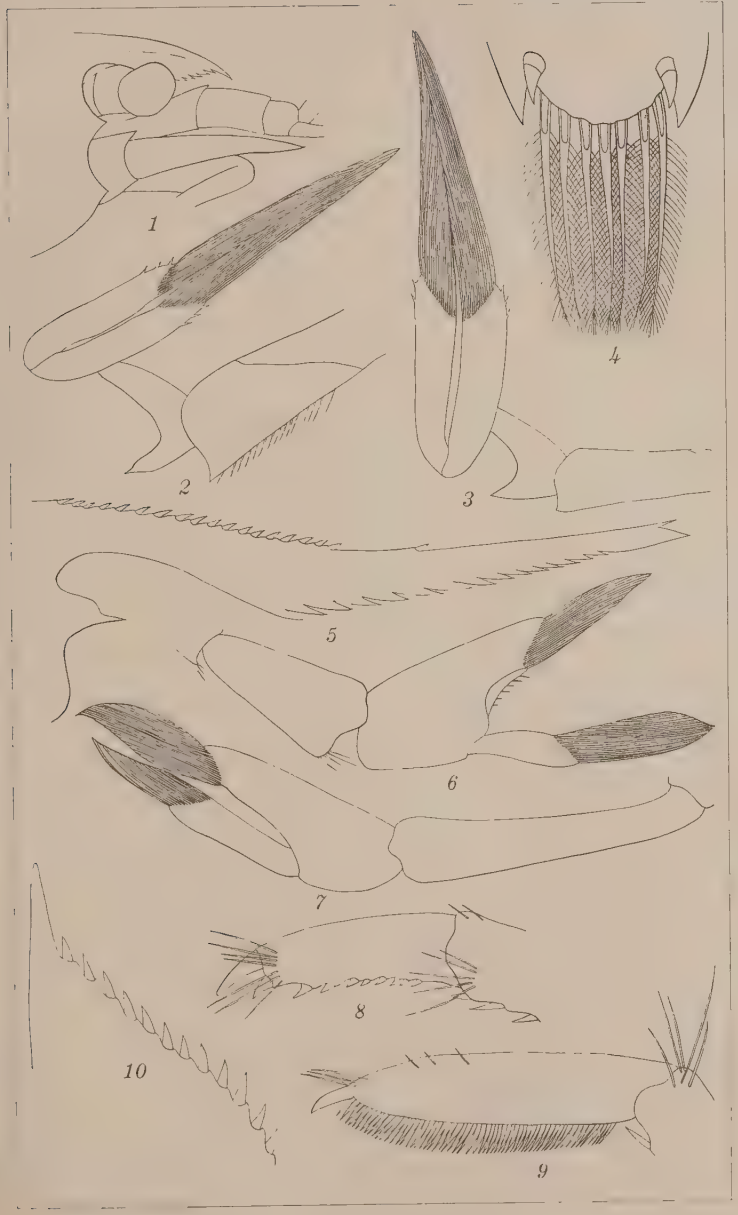

PLATE 1.

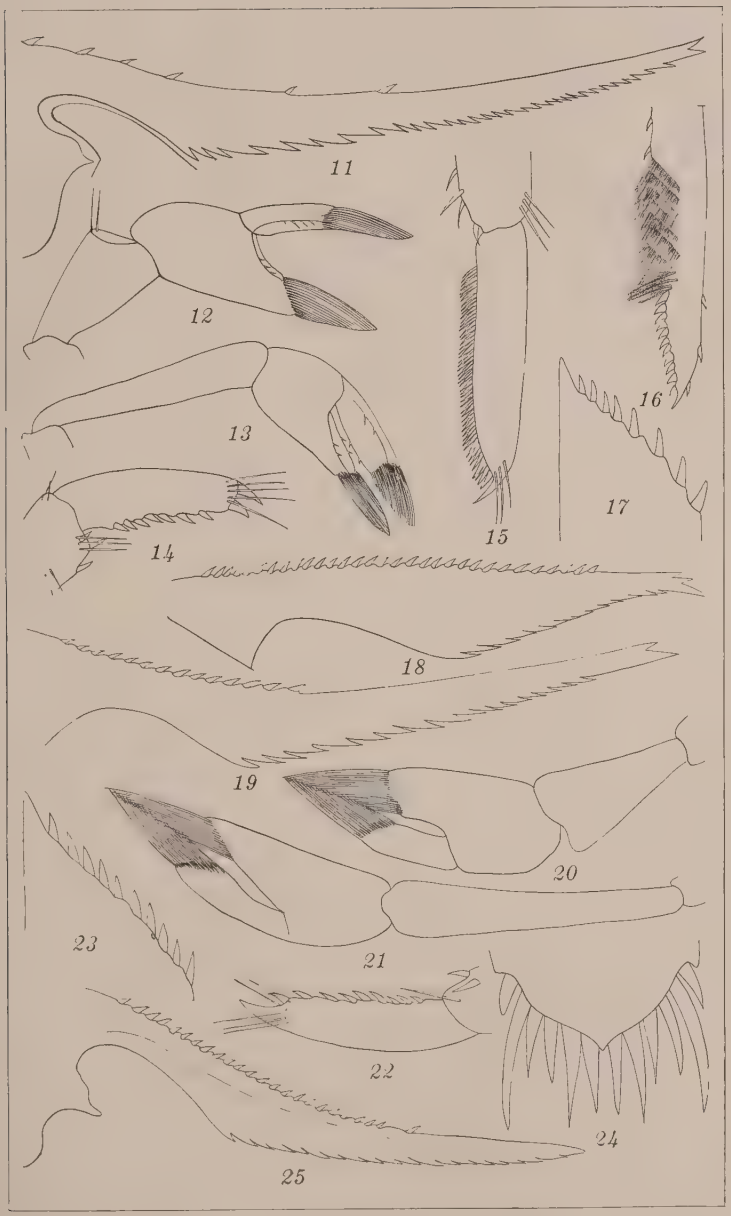

PLATE 2.

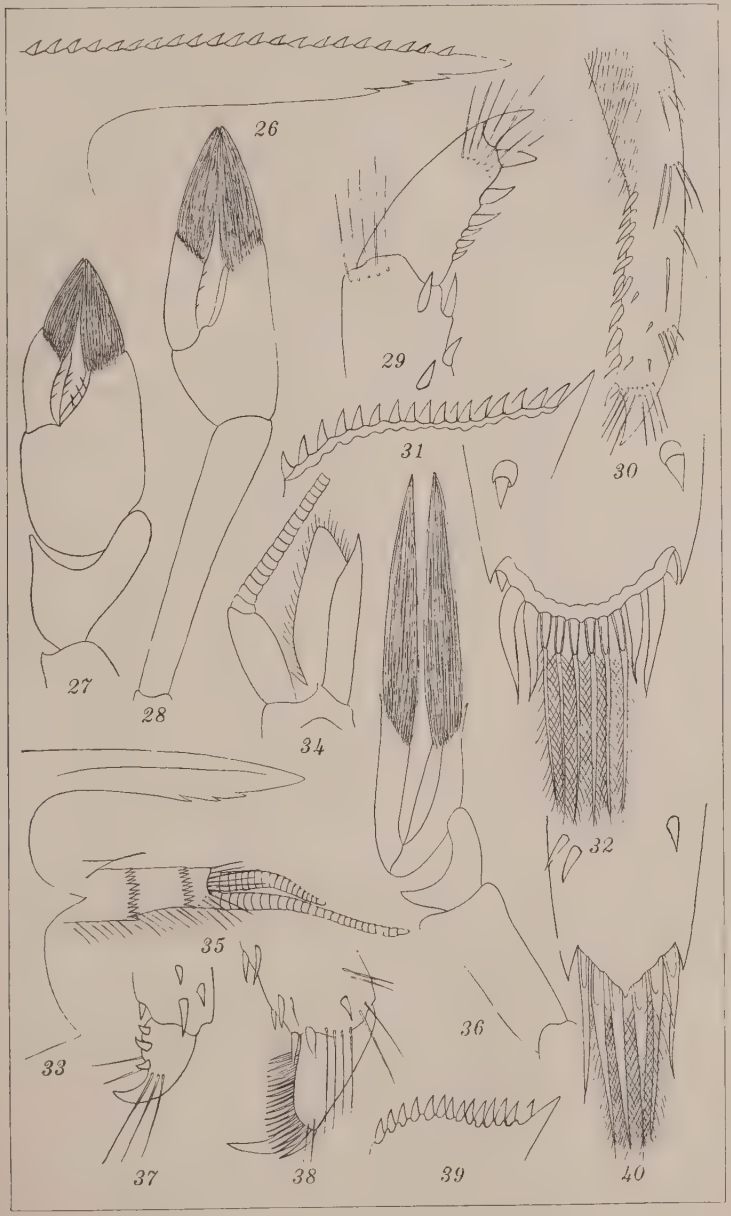

PLATE 3.

THE DEVELOPMENT OF THE HOMOCERCAL CAUDAL OF THE BLUE PERCH, TÆNIOTOCA LATERALIS AGASSIZ [1]

By GUILLERMO J. BLANCO

Of the Fish and Game Administration, Bureau of Science, Manila

ONE PLATE

The caudal fin of fishes is built upon the modification of the protocercal embryonic fin. Agassiz, Heckel, Huxley, Kölliker, Ryder, and many others have shown that the structure of the homocercal fin of bony fishes is a modified structure of the heterocercal caudal fin.

The structure of the acanthopterygian caudal fin in six genera was studied by Whitehouse (1910). He found that the structure of the tail fin may vary considerably in the same suborder. Apparently no one has studied the development of the caudal fin in the viviparous perches, hence the descriptions of the caudal fin of the blue perch are here given.

The protocercal caudal of a larva 3 mm long (Plate 1, fig. 1), is an extension of the notochord, the narrow dorsal fin is not continuous with the ventral fin fold.

The larva when 7 mm long (Plate 1, fig. 2) has an axial lobe, *axl*, that is narrow dorsally and wide ventrally with reference to the notochord, which curves slightly downwards.

The larva when 12 mm long (Plate 1, fig. 3) has a caudal fin heterocercal in general form. The notochord has its characteristic vacuolated structure and is turned upwards in the axial lobe. There are traces of six cartilaginous areas, *a*, *b*, *c*, *d*, *e*, and *f*, the anlage of the hypurals. Cartilaginous areas *d* and *e* have a common base, while areas *a*, *b*, *c*, and *f* are separated. To each cartilaginous hypural one or more caudal rays are attached for the support of the enlarging membrane of the caudal fin.

The caudal fin of a larva 14 mm long (Plate 1 fig. 4) has the notochord turned upwards toward the axial lobe. The beginnings of the neural spines, *ep*, first appear above the notochord.

[1] This work was done at the University of Washington as a partial fulfillment of the requirements for the degree of Master of Science.

The cartilaginous hypurals are still asymmetrically placed, as in Plate 1, fig. 3. The caudal fin has grown larger and most of the caudal rays arising at the distal end of the hypurals now lie more or less in line with the chordal axis.

The internal parts of the caudal fin of a larva 16 mm long (Plate 1, fig. 5) are still asymmetrically placed. Areas *a* and *d* have assumed a triangular shape; areas *b* and *c* are now parallel; *c* has its bases fused with those of *d* and *e*, so that all these hypurals now have a common base, while areas *a*, *b*, and *f* are separate. An additional cartilaginous hypural, *g*, is in evidence at this stage. The last two neural spines are also distinct.

Plate 1, fig. 6, shows a caudal fin of a larger larva. The axial lobe which was evident in smaller fishes has disappeared in the former stages.

The caudal fin of a larva 21 mm long (Plate 1, fig. 7) shows a marked shortening and thickening of the notochord, the hindmost portion of which becomes the urostyle. The vertebral segments of the caudal fin are still indistinct. Hypurals *a*, *b*, *f*, and *g* are separated, *b*, *c*, *d*, and *e* have fused bases. Cartilaginous areas *a* to *g* are in the process of ossification with the ventral part of the chordal axis. The dorsal caudal radials, *dcr*, are between the urostyle and the last neural spine. The caudal fin at this stage is externally symmetrical and fan-shaped, but internally it is asymmetrical.

In a larva 41 mm long (fig. 8) hypurals *a*, *b*, *c*, and *d* are joined to the urostyle. Hypural *e* is connected with the last vertebra and *g* with the penultimate vertebra. The three dorsal caudal radials are inserted deeper, and between the last neural spine and the urostyle. The segmented dermotrichia, *der*, are now well developed externally and overlap the edge of the three dorsal caudal radials, *dcr*, the hypurals, *hy*.

Plate 1, fig. 9, shows the caudal fin of a young perch, 51 mm long, in which the third dorsal caudal ray is inserted between the urostyle and the first hypural plate.

Plate 1, fig. 10, is the homocercal caudal of an adult female specimen 21 cm long. It has a much reduced urostyle. The last dorsal caudal ray is distinctly separated from the tip of the urostyle.

SUMMARY

1. *Tæniotoca lateralis* Agassiz is a viviparous blue perch found in shallow waters along the entire western coast of North America, between San Diego, United States, and Vancouver Island, Canada.

2. The developmental stages of the homocercal caudal fin of the blue perch are here described in detail for the first time.

3. The significant changes of the embryonic caudal fin of a larva 3 mm long to the homocercal caudal fin of the adult 21 cm long are as follows:

(*a*) The presence of an axial lobe in a 7-mm larva represents a characteristic feature of its embryonic development.

(*b*) The change of the protocercal caudal fin to heterocercal caudal fin in a larva 12 mm long, and the appearance of an anlage of six asymmetrical cartilaginous hypurals, each having one or more caudal rays.

(*c*) A larva 14 mm long has the beginnings of the neural spines which develop above the upturned notochord.

(*d*) The caudal fin of a larva 16 mm long has seven hypurals, the first four parallel to each other; the third, fourth, and fifth have a common base.

(*e*) The axial lobe at this stage is evidently lost.

(*f*) In a larva 21 mm long the urostyle is present as the result of the shortening and thickening of the posterior part of the notochord. Three dorsal caudal radials are at this stage inserted between the urostyle and the last neural spine.

(*g*) A larva 41 mm long has apparently hypurals which are joined to the penultimate vertebra, while the segmented dermotrichia are at this stage well developed.

(*h*) The caudal fin of a young perch 51 mm long shows a slight difference from that of an adult homocercal caudal fin of a specimen 21 cm long. The urostyle is much reduced in the adult, and the dorsal caudal rays are distinctly separated from the tip of the urostyle.

DEFINITION OF TERMS

DERMOTRICHIA. A caudal fin ray.

PROTOCERCAL. A protocercal caudal fin is a primitive type of a caudal, externally and internally symmetrical, indicating that the tail has not undergone any modification from the original form.

HETEROCERCAL. A heterocercal caudal is one in which an upbending of the vertebræ has taken place, and in which the hypaxial and epaxial elements and the caudal lobe of the fin are asymmetrically placed.

HOMOCERCAL. A homocercal caudal fin is a specialized heterocercal caudal, externally symmetrical; the majority of the fin rays are supported externally by the hypaxial elements; a urostyle, present in the larval stage, persists for a time in the adult.

UROSTYLE. The urostyle is an elongated conelike termination of the vertebral column, representing the fusion of several last vertebræ.

HYPAXIAL. Morphological structures ventral to the chordal axis.

EPAXIAL. Morphological structures dorsal to the chordal axis.

HYPURAL. Any hypaxial structure connected directly with the chordal axis to which one or more fin rays are attached.

EPURAL. Any epaxial element having direct connection with the chordal axis to which one or more fin rays are attached on its distal end.

RADIAL. Synonymous to "interspinous bone" and "somatid;" a daggerlike bone having no direct connection with the vertebral column; it supports one or more fin rays distally.

LAST VERTEBRAL SEGMENT. This term refers to the last centrum and the urostyle, if such structures exist; the last centrum is never perfect; it is usually conelike with the apex directed posterodorsally.

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ILLUSTRATIONS

ABBREVIATIONS USED

axl, Axial lobe.
a, *b*, *c*, *d*, *e*, *f*, *g*, Cartilaginous hypural areas.
cent, Centrum.
der, Dermotrichia.
dcr, Dorsal caudal radial.
ep, Epural.
f, Permanent caudal fin.
fn, Fin fold.
hs, Hæmal spine.
hy, Hypural.
lv, Last vertebra.
ns, Neural spine.
nt, Notochord.
ur, Urostyle.

PLATE 1. TÆNIOTOCA LATERALIS AGASSIZ

FIG. 1. A larva 3 mm long.
2. Caudal of a larva 7 mm long.
3. Caudal of a larva 12 mm long.
4. Caudal of a larva 14 mm long.
FIGS. 5 and 6. Caudal of a larva 16 mm long.
FIG. 7. Caudal of a larva 21 mm long.
8. Caudal of a larva 41 mm long.
9. Caudal of a young perch 55 mm long.
10. Adult homocercal caudal of a female 21 cm long.

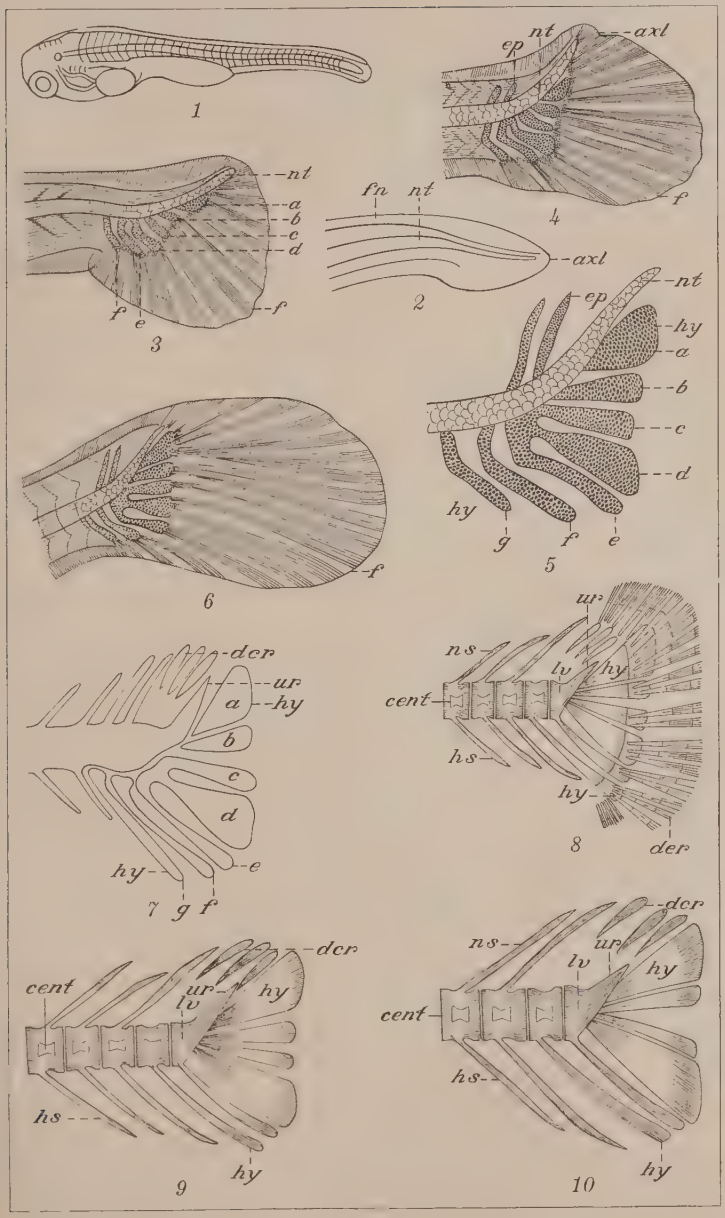
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PLATE 1.

PHILIPPINE MELIOLINEÆ [1]

By F. L. Stevens

Professor of Plant Pathology of the Unversity of Illinois; Charles Fuller Baker Memorial Professor of Plant Pathology (1930–1931) University of the Philippines

and

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THREE TEXT FIGURES

The purpose of the present article is to record the Meliolineæ collected by the senior author during his stay of eight months in the Philippines as Charles Fuller Baker Memorial Professor of Plant Pathology (1930–1931) that may be new, or upon hosts not previously recorded, or otherwise of especial interest. The arrangement is that of the senior author's monograph of the Meliolineæ.[2]

Specimens of all fungi noted in this article have been deposited in the herbarium of the University of Illinois, Urbana, Illinois; the herbarium of the Bureau of Science, Manila, Philippine Islands; and the herbarium of the College of Agriculture, Los Baños, Laguna, Philippine Islands. In addition, when material was of a quantity sufficient to warrant it, duplicate specimens were placed in several leading mycological centers in America. We are much indebted for determinations of hosts to Ranger Mamerto Sulit, of the School of Forestry, Los Baños; to Dr. Eduardo Quisumbing, botanist of the National Museum Division of the Bureau of Science; and to Dr. E. D. Merrill, director-in-chief of the New York Botanical Garden.

[1] Contribution No. 977 from the experiment station of the College of Agriculture, Los Baños, Laguna, Philippine Islands, and of the Department of Botany of the University of Illinois, Urbana, Illinois. Published with the approval of the dean of the College of Agriculture.

[2] Ann. Mycol. 25 (1927) 405; 26 (1928) 165.

Genus AMAZONIA Theissen

AMAZONIA PEREGRINA (Sydow) Sydow.

Group number 3101.4230.

On Myrsinaceæ: *Maesa laxa.* This species is widely distributed in Luzon, collections having been made in Benguet, La Union, Ilocos Sur, Bontoc, and Laguna.

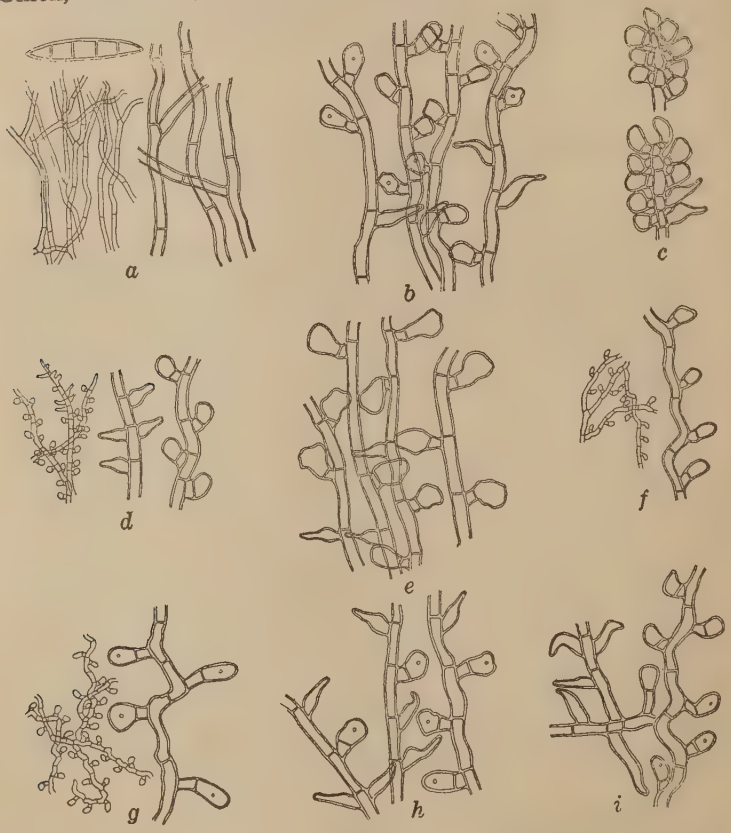

FIG. 1.

Genus MELIOLINA Sydow

MELIOLINA SAURAUIAE sp. nov. Fig. 1, a.

Colony epiphyllous, 3 to 15 mm in diameter, black, diffuse, indefinite. Mycelium 6 μ thick, crooked, smooth, branching at very acute angle. Spot none. Capitate hyphopodia and mucronate hyphopodia none.

Perithecial setæ and mycelial setæ none. Perithecia globose, 130 to 190 μ in diameter, very rough, surfaced with conic projections about 10 to 30 μ high. Asci evanescent, 2- to 4-spored. Spores 4-septate, long and narrow, 57 to 70 by 13 μ, end cells conic.

Group number 3100.6220.

On Dilleniaceæ: *Saurauia latibractea.* Naguilian Road, Benguet, Luzon, January 5, 1931, No. 1480.

This exceedingly interesting species falls within the section of the genus having no setæ, which section has only five species and three of these are recorded as parasitic upon other Meliolineæ. Of the two reported on phanerogams, one has 3-septate spores, thus leaving only one *Meliolina* that has the formula 3100; namely, *M. megalospora* (Speg.) Stevens, on *Jodina.* Comparison of the senior author's specimen with the type of this shows very distinct differences in colony and mycelial character, the present species having a thinner mycelium and a larger, looser colony. It is interesting that another *Meliolina, M. malacensis* (Sacc.) Stevens, is described on the Dilleniaceæ from Singapore; this one, however, has long and much-branched setæ.

MELIOLINA ARBORESCENS (Sydow) Sydow.

Group number 2140.5342.

In the senior author's monograph of the Meliolineæ, page 419, it was suggested that though *M. yatesii* was originally described by Sydow as being on *Viburnum,* in reality the host may be one of the Myrtaceæ. Dr. E. Quisumbing has definitely determined for us that the host of the type material is not a *Viburnum* but a *Eugenia.* Therefore, the synonymy suggested by one of us in the monograph is confirmed.

Genus IRENE Theissen and Sydow

IRENE PAPILLIFERA Sydow.

Group number 3201.4320.

On Dilleniaceæ: *Saurauia elegans.* Three collections were made on the road from Baguio to Naguilian, Mountain Province, Luzon.

Genus IRENOPSIS Stevens

IRENOPSIS BENGUETENSIS sp. nov. Fig. 1, b.

Colony 2 to 20 mm in diameter, amphigenous, black, indefinite. Mycelium 6 to 7 μ thick, black, smooth, slightly crooked. Spot none. Capitate hyphopodia alternate, not crowded, usual-

ly about 30 μ apart, often less close. Stalk cell short, 4 to 6 μ, head cell pyriform, regular or slightly irregular. Mucronate hyphopodia ampulliform, alternate or opposite.

Perithecial setæ arising from the lower half of the perithecium, 70 to 105 μ long, 10 μ thick, simple, black, straight or slightly curved. Mycelial setæ none. Perithecia globose, smooth, 100 to 115 μ in diameter. Asci evanescent. Spores 4-septate, 40 by 13 to 15 μ.

Group number 3401.3220.

On Moraceæ: *Ficus variegata.* Naguilian Road, Benguet, Luzon, January 5, 1931, Nos. 1566 (type) and 1528.

No species of *Irenopsis* has heretofore been described on *Ficus* or any other genus of the Moraceæ. This species is very clearly characterized by the entire absence of mycelial setæ and the presence of a few short black setæ arising from the base of the perithecium.

IRENOPSIS CORONATA (Speg.) Stevens var. PHILIPPINENSIS var. nov. Fig. 3, 1.

Colony very minute, almost invisible. Mycelium dark, smooth, 6 to 7 μ thick. Spot none. Capitate hyphopodia alternate, in some colonies few, in others more abundant. Stalk cell short, 3 to 4 μ, head cell pyriform, regular. Mucronate hyphopodia ampulliform, often very abundant, present almost to the exclusion of the capitate hyphopodia.

Perithecial setæ few, 6 to 8, growing from the lower part of the perithecium, 100 to 130 μ long, not uncinate. Mycelial setæ none. Perithecia globose, black, smooth, except for a few setæ arising from near the base. Asci evanescent. Spores 4-septate.

Group number 3401.4220.

On Tiliaceæ: *Columbia serratifolia.* Agricultural College, Laguna Province, Luzon, September 10, 1930, No. 510.

The irregular arrangement of the hyphopodia is striking. Sometimes the capitate hyphopodia are abundant and regularly placed; at other times they are very irregularly placed, giving the mycelium almost the appearance of a branch without hyphopodia. In some colonies the capitate hyphopodia are exceedingly rare, while the mucronate hyphopodia are very common.

This variety differs from other varieties of this species in its variable ratio between mucronate and capitate hyphopodia and in the shape of its capitate hyphopodia, which are pyriform while in the other varieties the capitate hyphopodia are shorter,

almost globose. It is striking to note that the only Meliolineæ described on the Tiliaceæ are *Irenopsis coronata* and three varieties of this fungus. Two species of *Irenina* that were originally described on other families are said to be found on Tiliaceæ, but they may rest upon erroneous determinations. Though only this one species and its four varieties are known upon the Tiliaceæ, they are widely distributed, being recorded from Paraguay, Africa, Brazil, Argentine, Porto Rico, Santo Domingo, and the Philippines.

IRENOPSIS CORONATA (Speg.) Stevens var. TRIUMFETTAE (Stevens) Stevens.

Group number 3401.4220.

On Tiliaceæ: *Triumfetta bartramia.*

Hyphæ of considerable length without hyphopodia frequently occur, especially within areas near the perithecia.

A *Meliola* on *Triumfetta* which has been reported from the Philippines as *M. arachnoidea* is probably this variety.

The remarkable agreement in the character of the colony on the leaf and the morphology of this fungus on *Triumfetta* from such widely separated parts of the world as Porto Rico, South Africa, and the Philippine Islands is noteworthy.

Genus IRENINA Stevens

IRENINA ACALYPHAE sp. nov. Fig. 1, c.

Colonies small, mostly less than 2 mm in diameter, amphigenous, densely black, circular. Mycelium 7 to 8 μ thick, densely crowded. Spot none. Capitate hyphopodia opposite, densely crowded, touching. Stalk cell short, 3 to 4 μ, head cell subglobose to subcubical. Mucronate hyphopodia ampulliform.

Perithecial setæ none. Mycelial setæ none. Perithecia globose, 130 to 145 μ in diameter, very rough with conic protuberances up to 30 μ high, though with no true larviform appendages. Asci evanescent. Spores 4-septate, 47 by 16 μ.

Group number 3102.4220.

On Euphorbiaceæ: *Acalypha.* Acop's, Benguet, Luzon, December 30, 1930, No. 1211.

Although five species of *Irenina* are recorded as upon the Euphorbiaceæ, none of them has opposite capitate hyphopodia. The extreme roughness of the perithecial wall suggests the genus *Irene,* but no actual vermiform appendages were found, nor is any species of *Irene* with opposite hyphopodia known on this host family. The formula is close to that of *Amazonia acalyphae,* but the perithecia here are free and globose and show no

kinship to *Amazonia*. The chief characteristic of the species is the very rough perithecium and the very dense character of the colony.

IRENINA RUBI sp. nov. Fig. 1, d.

Colony very small, nearly invisible, usually consisting of only a few mycelial strands. Mycelium 6 to 7 μ thick. Spot none. Capitate hyphopodia alternate, usually about 23 μ apart. Stalk cell short, 3 to 4 μ, head cell globose, regular. Mucronate hyphopodia ampulliform, 16 to 20 μ long.

Perithecial setæ none. Mycelial setæ none. Perithecia globose, smooth, 130 to 145 μ in diameter. Asci evanescent. Spores 4-septate, 33 to 36 by 14 μ.

Group number 3101.3220.

On Rosaceæ: *Rubus rosaefolius*. Naguilian Road, Benguet, Luzon, January 6, 1931, No. 1549 (type); Sariaya, Tayabas Province, Luzon, August 9, 1930, No. 193.

On *Rubus molucanus*. Mount Santo Tomas, Benguet, Luzon, December 31, 1930, No. 1361.

IRENINA RUBI var. ANGULATA var. nov. Fig. 1, e.

This variety is like the species except that the capitate hyphopodia have head cells that are irregular to angular and large, to 17 μ across.

On Rosaceæ: *Rubus molucanus*. Naguilian Road, Benguet, Luzon, January 6, 1931, No. 1461 (type).

Rubus rosaefolius, Naguilian Road, Benguet, Luzon, January 6, 1931, No. 1472.

These two forms of *Meliola*, each occurring on two species of *Rubus* in the same region of Luzon, are interesting. Sometimes either one or the other of the species is found alone upon a given collection. On other collections both varieties may occur side by side upon the same leaf. There is, however, no evidence of intergrading of the two forms; one has the small regular head cells, the other the large irregular ones.

The Meliolineæ upon Rosaceæ in the Philippines are especially interesting since of the five species previously described three had 3-septate spores and two had 4-septate spores. Moreover, the 3-septate species were of wide distribution, including the United States, South America, Japan, Porto Rico, Hawaii, and Africa, while the two 4-septate species were known only from the Argentine and Brazil. It appears, therefore, that the preponderant type upon Rosaceæ was that of 3-septa.

In the Philippines no species had heretofore been reported upon *Rubus*, doubtless due to their very minute, inconspicuous colonies. The species now found upon *Rubus* are all of the 4-septate type, none with 3-septate spores.

It may be possible that the Philippine Meliolineæ upon *Rubus* have comparatively recently acquired tenancy upon that host, coming perhaps from some other host, and that the present poorly developed colony may be due to the fact that they have not become as well adapted to their host as have the 3-septate forms, which have had much longer residence upon Rosaceæ.

IRENINA ANGUSTISPORA sp. nov. Fig. 1, f.

Colony 1 to 3 mm in diameter, thin, hypophyllous. Mycelium 4 to 5 μ thick, very crooked, often zigzag, smooth. Spot none. Capitate hyphopodia alternate or unilateral, usually from 13 to 35 μ apart. Stalk cell short, 3 to 4 μ, head cell subglobose, oblong or cuneiform. Mucronate hyphopodia ampulliform.

Perithecial setæ none. Mycelial setæ none. Perithecia globose, smooth, 146 to 175 μ, black, very rough with conic black projections about 16 μ high, which simulate but are not larviform appendages. Asci evanescent. Spores 4-septate, 33 by 7 to 9 μ.

Group number 3101.2120.

On Rubiaceæ: *Neonauclea* sp. Naguilian Road, Benguet, Luzon, January 7, 1931, No. 1620.

This species is chiefly characterized by its very rough perithecium, very crooked mycelium, and very narrow ascospores. It differs from all Ireninæ on the Rubiaceæ in these regards.

IRENINA ANGUSTISPORA Stevens var. LAEVIS var. nov. Fig. 1, g.

On Rubiaceæ: *Neonauclea*. Kennon Road, Benguet, Luzon, January 8, 1931; No. 1633.

This variety is like the species except that the perithecia are smooth.

IRENINA CALLICARPAE sp. nov.

Colony epiphyllous, of indefinite shape, not very dark, mycelium smooth, crooked, about 5 μ thick, anastomosing profusely, forming a network. Spot none. Capitate hyphopodia alternate, usually 33 to 50 μ apart. Stalk cell short, 4 to 11 μ long, head cell ovate to pyriform, regular. Mucronate hyphopodia ampulliform, pale, thin.

Perithecial setæ none. Mycelial setæ none. Perithecia globose, 150 μ in diameter, rough due to conical surface cells. Asci evanescent. Spores 4-septate, 36 by 17 μ.

Group number 3101.3220.

On Verbenaceæ: *Callicarpa magna.* Naguilian Road, Benguet, Luzon, January 6, 1931, No. 1468 (type); Santo Tomas, La Union Province, Luzon, December 31, 1930, No. 1291.

Of the five species of *Irenina* recorded as upon members of the Verbenaceæ and that have alternate capitate hyphopodia, only *I. glabroides* and *I. vitis* have spores as small as those in the present species, and each of these differs markedly in mycelial character, not anastomosing freely as is the case with the present species. The distinctive character of this species is the abundant anastomosis of the mycelium, making the colony into a distinct network.

IRENINA THUNBERGIAE sp. nov. Fig. 1, h.

Colony 1 to 4 mm in diameter, loose, epiphyllous. Mycelium 6 μ thick, crooked. Spot none. Capitate hyphopodia alternate, usually 16 to 26 μ apart, sometimes 70 μ. Stalk cell to 10 μ long, head cell large, angular, 16 μ. Mucronate hyphopodia ampulliform, scarce.

Perithecial setæ none. Mycelial setæ none. Perithecia globose, 145 to 160 μ, rough with conic protuberances, about 15 μ high. Asci evanescent. Spores 4-septate, 43 by 16 μ.

Group number 3101.4220.

On Acanthaceæ: *Thunbergia alata.* Kennon Road, Benguet, Luzon, January 8, 1931, No. 1642.

This in its larger, more irregular head cells, and its much less dense and larger colony shows no resemblance to *I. irregularis.*

IRENINA SANDORICI (Rehm) Stevens.

Group number 3101.2220.

On Meliaceæ: *Sandoricum koetjape.* Agricultural College, Laguna Province, and Quezon Forest Park, Tayabas Province, Luzon.

IRENINA SINUOSA sp. nov. Fig. 1, i.

Colony hypophyllous, thin, scattered, indefinite, to 2 cm in diameter. Mycelium very crooked, so as to give the appearance of anastomosing, thin, 3 to 4 μ. Spot none. Capitate hyphopodia alternate or unilateral, usually about 25 μ apart. Stalk cell short, 3 to 4 μ, standing out at right angles to the mycelium, head cell cylindrical or ovate. Mucronate hyphopodia ampulliform.

Perithecial setæ none. Mycelial setæ none. Perithecia globose, black, somewhat rough, 140 to 175 μ in diameter. Asci evanescent. Spores 4-septate, 50 to 57 by 17 μ.

Group number 3101.4220.

On Euphorbiaceæ: *Glochidion* sp. Balete Pass, Nueva Ecija Province, Luzon, January 9, 1931, No. 1744 (type).

This species does not have capitate hyphopodia close or globose as in *M. alchoreae,* nor very few as in *I. subapoda* and *I. verrucosa.* It differs from *I. alchorneae* in its crooked mycelium.

IRENINA SUBAPODA (Sydow) Stevens.

Group number 3101.3220.

On Euphorbiaceæ: *Mallotus philippinensis.* Balete Pass, Nueva Ecija Province, Luzon.

IRENINA UNCARIÆ (Rehm) Stevens.

Group number 3102.2220.

On Rubiaceæ: *Uncaria perrottetii.* Collections were made from Laguna, Benguet, and Tayabas Province, Luzon.

IRENINA COMBRETI Stevens.

Group number 3101.4220.

On Combretaceæ: *Quisqualis indica.* Santa Cruz, Laguna Province, Luzon.

None of the Meliolineæ has been reported before upon *Quisqualis.*

Genus MELIOLA Fries

GROUP 1. Spores 2– or 3–septate; formula ½ – – –. or 2 – – –. or ⅔ – – –.

MELIOLA PALAQUII sp. nov. Fig. 2, a.

Colony 4 to 6 mm in diameter, often coalescing, black, circular, amphigenous but mainly hypophyllous. Mycelium 6 μ thick, slightly crooked, black. Spot blanched. Capitate hyphopodia alternate, not crowded, 16 to 135 μ apart. Stalk cell long, to 13 μ, head cell large, to 23 μ, very irregular and angled. Mucronate hyphopodia ampulliform, thick, long.

Perithecial setæ none. Mycelial setæ about 200 μ long, 5 to 6 μ thick at base, tapering to 3 μ thick at apex, obtuse, mastigal. Perithecia sparse, globose, smooth, 145 to 175 μ in diameter. Asci evanescent. Spores 3-septate, 50 to 54 by 16 to 20 μ, the two central cells large, the end cells smaller and somewhat conical.

Group number 211.5221.

On Sapotaceæ: *Palaquium* sp. Mount Maquiling, Laguna Province, Luzon, January 18, 1931, No. 1900.

This beautiful species differs markedly in the very irregular head cells from all other species found upon the Sapotaceæ, also in having 3-septate spores and the long whiplike setæ. It is the only species known on this family with 3-septate spores.

GROUP 3. Formula 314–. or 31¾.

MELIOLA GANOPHYLLI sp. nov. Fig. 3, k.

Colony 1 to 3 mm in diameter, very black, very dense. Mycelium 6 to 7 μ thick, strands growing side by side so as to cover completely the subtending surface. Spot none. Capitate hyphopodia alternate, closely crowded. Stalk cell short, 3 to 4 μ, head cell globose. Mucronate hyphopodia ampulliform.

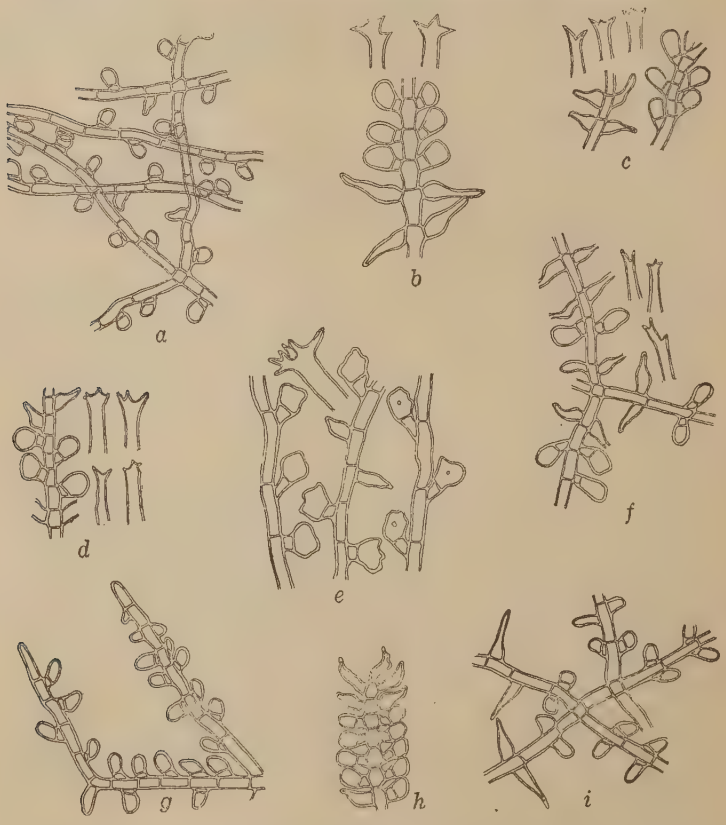

FIG. 2.

Perithecial setæ none. Mycelial setæ numerous, 190 to 300 μ long, 7 μ thick at base, apex bearing two, three, or four short, 2- to 6-μ teeth, or rarely twice branched, and primary branches 20 μ long. Perithecia globose, smooth, 145 to 160 μ in diameter. Asci evanescent. Spores 4-septate, 47 to 50 by 20 μ.

Group number 31⅝–1.4221.

On Sapindaceæ: *Ganophyllum falcatum.* Kennon Road, Benguet, Luzon, January 8, 1931, No. 1671.

This species differs from *M. sapindacearum* in having no opposite capitate hyphopodia; from *M. sapindi,* which has larger and more irregular head cells and a less dense colony; it is close to *M. paulliniae* var. *dentata* but differs from it in head cells and in density of colony. No *Meliola* has heretofore been recorded upon this host genus.

MELIOLA PATENS Sydow.

Group number 3141.4231.

Collection was made at Balete Pass, Nueva Ecija Province, Luzon, on *Murraya paniculata.* It had not been before reported on this genus.

MELIOLA HETERODONTA Sydow.

Group number 31⅝–1.3223.

This species was described by Sydow as on an unknown host. The host of the type specimen was determined for us by Dr. E. Quisumbing as *Dracontomelum dao,* of the Anacardiaceæ.

MELIOLA MICROMELI sp. nov. Fig. 2, b.

Colony 1 to 3 mm in diameter, amphigenous, more often epiphyllous, black, very dense, crustose. Mycelium 6 μ thick, smooth, crooked. Spot pale, showing from both sides of the leaf. Capitate hyphopodia usually alternate, rarely opposite, densely crowded, usually less than 6 μ apart. Stalk cell short, 3 to 4 μ, head cell ovate, regular. Mucronate hyphopodia ampulliform, narrow.

Perithecial setæ none. Mycelial setæ very numerous, 220 μ long, 7 μ thick at base, dentate with two to five short teeth, usually 3 to 5 μ long, sometimes forked with two branches 20 μ long and these with short teeth. Perithecia globose, smooth, 145 to 150 μ in diameter. Asci evanescent, 2-spored. Spores 4-septate, 47 to 53 by 16 to 21 μ.

Group number 31⅝–3.5221.

A strikingly unique character of this fungus is that the mycelial strands near the edge of the colony for a zone some 150 to 200 μ wide, run parallel with each other and touching each other and in this zone they are almost or quite devoid of hyphopodia.

On Rutaceæ: *Micromelum minutum.* San Jose to Balete Pass, Nueva Ecija Province, Luzon, January 6, 1931, No. 1726.

This species differs from all of the nineteen species of *Meliola* described as on the Rutaceæ. It is most nearly related perhaps to *M. tenella, M. bambusae* var. *atlantiae,* and *M. evodeae.* From *M. tenella* and *M. bambusae* var. *atlantiae* it differs in having a dense colony. *Meliola evodiae* does have a dense colony but does not have the character of colony given above, nor are its setæ so long.

GROUP 4. Formula 313–.

MELIOLA BENGUETENSIS sp. nov. Fig. 2, c.

Colony 1 to 6 mm in diameter, amphigenous, very black, very dense. Mycelium 6 μ thick, smooth. The mycelium at the edge of a colony constituting a zone about 200 mm wide that is pale and devoid of hyphopodia and setæ. Spot pale yellow, devoid of chlorophyll, visible from both sides of the leaf. Capitate hyphopodia alternate or unilateral, somewhat crowded. Stalk cell short, 3 to 4 μ, head cell subglobose, regular. Mucronate hyphopodia ampulliform, very irregular, numerous on some hyphæ, mostly opposite.

Perithecial setæ none. Mycelial setæ very black, 250 to 270 μ long, 10 μ thick at base, with 2, 3, or 4 short, 6- to 7-μ teeth at apex. Perithecia globose, smooth, 145 to 160 μ in diameter. Asci evanescent. Spores 4-septate, 47 to 50 by 17 μ.

Group number 3131.4221.

On Sapindaceæ: *Otophora* sp. Kennon Road, Benguet, Luzon, January 8, 1931, No. 670 (type); San Jose-Balete Road, Nueva Ecija Province, Luzon, January 10, 1931, No. 1794.

The only species of *Meliola* upon the Sapindaceæ of the formula 3131. are *M. paulliniae* var. *dentata* and *M. sapindi,* the latter differing from the present form in having irregular head cells, while the former is distinguished by its thin colony.

The colony edge of the species is characteristic.

MELIOLA PISTACIAE sp. nov. Fig. 2, d.

Colony 1 to 3 mm in diameter, circular, densely black, amphigenous but mainly epiphyllous, also caulicolous. Mycelium 6 μ thick, densely crowded. An outer zone of each colony consists of paler mycelium that bears no hyphopodia or setæ. Spot none. Capitate hyphopodia alternate, very rarely opposite, closely crowded. Stalk cell short, 3 μ, head cell subglobose, regular. Mucronate hyphopodia ampulliform.

Perithecial setæ none. Mycelial setæ 233 to 277 μ long, 8 μ thick at base, apex bearing two or three short, 5 to 9 μ,

acute teeth. Perithecia globose, smooth, 145 μ in diameter. Asci evanescent. Spores 4-septate, 43 by 16 μ.

Group number 3131.5221.

On Anacardiaceæ: *Pistacia* sp. San Jose to Balete Pass, Nueva Ecija Province, Luzon, January 9, 1931, No. 1712.

Three species of *Meliola* of the formula 3131. have their type forms on the Anacardiaceæ. Two of these have cristate setal tips, thus disagreeing with the present species. From the third species, *M. brachyodonta* Syd., it differs decidedly in the colony character described above.

MELIOLA THEMEDAE sp. nov. Fig. 2, e.

Colony amphigenous, 1 to 3 mm in diameter, black, dense, almost crustose. Mycelium 6 to 7 μ thick, straight, longitudinally on the leaf, crooked transversely. Spot none. Capitate hyphopodia alternate. Stalk cell to 10 μ long, head cell irregular, angular. Mucronate hyphopodia ampulliform, small.

Perithecial setæ none. Mycelial setæ stiff, straight, black, 160 to 190 μ long, 10 μ thick at base, somewhat enlarged and divided into numerous short teeth at tip, subcristate. Perithecia globose, smooth, 130 to 145 μ. Asci and spores not seen.

Group number ?131.??21.

On Gramineæ: *Themeda gigantea.* Muñoz, Nueva Ecija Province, Luzon, October 3, 1930, No. 794.

The setal tips are quite striking, different from any others that the senior author has seen.

GROUP 5. Formula $31\frac{2}{3}$–. or $31\frac{1}{3}$–. or $31\frac{1}{2}$–.

MELIOLA HETEROCEPHALA Sydow.

Group number $31\frac{2}{3}$–1.3221.

This is a well-defined species characterized by its irregular setal tips on setæ that abound only near the perithecia. Occasionally a leaf bearing *M. desmodii* may also have colonies of *M. heterocephala.* The two colonies on close observation can be distinguished by their habit and by the capitate hyphopodia. On *Desmodium* occur several forms of *Meliola* recorded as distinct species, and the number on the Leguminosæ is very large. Many of these show a common character, probably indicating a common ancestry, in their small, globose, capitate hyphopodia. These segregate into species since some have the hyphopodia strictly opposite, others strictly alternate, etc.; also by variation in the length of the mycelial setæ or in possessing characteristic setal tips. Frequently two nearly related species occur

on the same leaf and at first may then be puzzling to the taxonomist.

MELIOLA LITSEAE Sydow.

Group number 31⅓–1.4223.

This species is very common in the Philippines and is much more variable than the description of Sydow would lead one to expect. Sydow's description gives the setæ as 350 to 700 μ long, while on some of our specimens we find them over 1,400 μ, others being as short as is indicated by Sydow's description. In length of setæ this species resembles *M. magna* Stevens described from Costa Rica on *Nectandra*. No other species upon the Lauraceæ and, indeed, but few other species of *Meliola* have setæ more than 1 mm long. This species differs strikingly from *M. magna* in its smaller spores.

MELIOLA NEPHELIICOLA sp. nov. Fig. 2, f.

Colony 3 to 10 mm in diameter, hypophyllous, black, indefinite, adhering very closely to the leaf surface. Mycelium 4 to 5 μ thick, crooked. Spot none. Capitate hyphopodia alternate or opposite. Stalk cell short, 3 to 4 μ, head cell subglobose. Mucronate hyphopodia ampulliform.

Perithecial setæ none. Mycelial setæ 185 to 470 μ long, 10 μ thick at base, either simple and acute or with a few very minute teeth. Perithecia globose, smooth, 150 to 190 μ in diameter. Asci evanescent. Spores 4-septate, 40 by 13 μ.

Group number 31⅓–3.3222.

On Sapindaceæ: *Nephelium intermedium*. Mount Maquiling, Laguna Province, Luzon, July 22, 1930, No. 77.

This differs from *M. capensis* in that it has a much less dense colony; its hyphopodia are not always opposite as they are in *M. capensis*. It differs from *M. variaseta* in its acute setal apices. It differs from *M. nephelii* in shape of hyphopodia and abundance of setæ.

GROUP 6. Formula 312–. or 31½–.

MELIOLA MEGALOPODA Sydow.

Group number 3121.5343.

This species was described by Sydow as on an unknown host. Ranger Mamerto Sulit, of the School of Forestry, Los Baños, has kindly determined the host of the type specimen as *Eugenia*, of the Myrtaceæ. It appears to be closely related to *M. densa* but differs from it in having much shorter setæ.

MELIOLA ANDROPOGONIS sp. nov. Fig. 3, l.

Colony epiphyllous, circular or ovate, 1 to 3 mm in diameter, black, dense. Mycelium 6 to 7 μ thick, straight. Spot none. Capitate hyphopodia alternate. Stalk cell short, 3 to 4 μ, head cell ovate, subglobose or more often angular. Mucronate hyphopodia ampulliform.

Perithecial setæ none. Mycelial setæ simple, obtuse, hamate, 140 to 220 μ long. Perithecia globose, smooth. Asci evanescent. Spores 4-septate.

Group number 3121. – – –1.

On Gramineæ: *Andropogon halepensis.* Naguilian Road, Benguet, Luzon, January 7, 1931, No. 1577.

Of the thirteen species of *Meliola* recorded on the Gramineæ only *M. panici* has been reported as on *Andropogon.* The hamate setæ and the irregular hyphopodia characterize the present species.

GROUP 7. Formula 3113.

MELIOLA SYMPHOREMAE sp. nov. Fig. 2, g.

Colony 5 to 10 mm in diameter, indefinite, black, hypophyllous. Mycelium 6 μ thick, somewhat crooked. Spot none. Capitate hyphopodia opposite or alternate, mainly opposite, pairs somewhat crowded, often only 13 μ apart. Stalk cell short, 3 to 4 μ, head cell irregularly ovate or oblong, 10 to 13 μ long. Mucronate hyphopodia ampulliform, very numerous, alternate or opposite, mostly opposite, 30 μ long, 7 μ wide.

Perithecial setæ none. Mycelial setæ numerous, 300 to 585 μ long, 10 μ thick at base, black, simple, obtuse or acute. Perithecia globose, smooth, 190 μ in diameter. Asci evanescent. Spores 4-septate, 40 by 17 μ.

Group number 3113.3223.

On Verbenaceæ: *Symphorema luzonicus.* Mount Maquiling, Laguna Province, Luzon, No. 655.

Only one species of the formula 3113, *M. callicarpae,* is recorded as on the Verbenaceæ and that has shorter setæ and smaller, more regular head cells and is a very distinct species. On the type material there is another *Meliola,* undetermined, that has strictly alternate capitate hyphopodia and the colony of which is thinner, more diffuse. Both of these species are parasitized by a *Helminthosporium,* which, however, is of much more dense growth on the undetermined *Meliola* than upon *M. symphoremae,* indicating that these parasites upon the *Meliola* are biologically differentiated as to their hosts.

MELIOLA KOAE Stevens.

Group number 3113.4231.

The specimens on *Acacia confusa* in the Philippine Islands show no differences from the type material collected by the senior author on *Acacia koa* in Hawaii. Though these two species of *Acacia* are both phyllodinous, they are not closely allied. It seems probable that both species of hosts derived the *Meliola* from some remote ancestor, probably Australian.

MELIOLA BAKERI Sydow.

Group number 3113.4222.

A collection was made on Mount Maquiling on *Cissampelos* on which genus it has not before been reported.

MELIOLA GLABRIUSCULA Spegazzini.

Meliola glabriuscula SPEGAZZINI, Rev. Mus. La Plata 15 (1908) 15.

Group number 3113.3231.

This species is recorded in the senior author's monograph, based on the original description, as of the formula 3112. Study of Spegazzini's original specimen shows the hyphopodia often to be alternate; therefore, the above formula is correct.

MELIOLA CALLICARPAE Sydow.

Group number 3113.3222.

The form of this species that occurs upon *Callicarpa ereoclona* differs slightly from the type, but this is not other than might be expected, owing to the fact that *C. ereoclona* is densely covered with hairs while *C. cana* is not.

GROUP 8. Formula 3112.

MELIOLA OPPOSITA Sydow.

Group number 3112.3222.

On *Aglaia diffusa*. Mount Maquiling, Laguna Province, Luzon. This fungus had not been reported on this genus.

MELIOLA PISONIAE sp. nov. Fig. 2, h.

Colony 1 to 3 mm in diameter, hypophyllous, circular, densely black, velvety, falling away from the leaf when dry. Mycelium 6 to 7 μ thick, dark, smooth, straight. Spot none. Capitate hyphopodia opposite, densely crowded, touching. Stalk cell short, head cell entire, globose. Mucronate hyphopodia ampuliform, not numerous.

Perithecial setæ none. Mycelial setæ straight, stiff, simple, acute, black, to 10 μ thick at base, 540 to 730 μ long. Peri-

thecia numerous, globose, 146 to 189 μ, surface slightly rough. Asci evanescent. Spores 44 to 50 by 13 to 14 μ.

Group number 3112.4223.

On Nyctaginaceæ: *Pisonia umbellifera.* Mount Maquiling, Los Baños, Laguna Province, Luzon, August 8, 1930, No. 373 (type).

Only two species have heretofore been reported as upon species of the Nyctaginaceæ—namely, *M. pulchella* and *M. eriophora*—both of which differ markedly from the present species. The most striking character of this species is the densely black colony composed of mycelium that branches so closely as to form a dense mat over the occupied area. The very crowded condition of the capitate hyphopodia also adds to the density of the colony.

MELIOLA MALACOTRICHA Spegazzini.

Group number 3112.3231.

Collections were made on *Hewittia sublobata, Hewittia bicolor, Lepistemon bebictariferum,* and an undertermined *Ipomoea.* Though not reported from the Philippines as this species before, it has been reported under its various synonyms.

MELIOLA RUBI sp. nov. Fig. 2, 1.

Colony 1 to 3 mm in diameter but very abundant and often coalescing to cover large areas of the leaf, black hypophyllous. Mycelium 6 to 7 μ thick, slightly crooked, with a strong tendency to branch at right angles and opposite. Spot none. Capitate hyphopodia nearly always opposite, usually about 17 μ apart. Stalk cell short, 3 to 4 μ, head cell oblong, about 14 by 7 μ, sometimes somewhat irregular. Mucronate hyphopodia long, conic.

Perithecial setæ none. Mycelial setæ simple, straight, acute, 277 μ long, 6 to 7 μ thick at base, quite numerous and distributed generally over the mycelium; that is, not limited to the perithecial region. Perithecia globose, smooth, about 90 μ in diameter. Asci evanescent. Spores 4-septate, 47 to 50 by 17 μ.

Group number 3112.4211.

On Rosaceæ: *Rubus molucanus.* Naguilian Road, Benguet, Luzon, January 6, 1931, No. 1469.

Comparison of this species with the type of *M. glabriuscula,* the only other *Meliola* recorded as on the Rosaceæ, shows very distinct differences, particularly as the mycelial setæ in *M. glabriuscula* are limited to the neighborhood of the perithecia,

while in the present species they are widely distributed on the mycelium.

MELIOLA AGELAEAE sp. nov. Fig. 3, g.

Colonies amphigenous, irregularly circular, 3 to 8 mm in diameter, dense to crustose, black, often variously parasitized. Mycelium 6 to 7 μ thick, dark. Capitate hyphopodia opposite, close together. Stalk cell short, 3 to 4 μ, head cell cylindrical, oblong. Mucronate hyphopodia ampulliform.

Perithecial setæ none. Mycelial setæ simple, acute, 365 μ long, 10 to 11 μ thick at base. Perithecia globose, smooth, 140 to 180 μ in diameter. Asci evanescent. Spores 4-septate, 47 by 17 μ.

Group number 3112.4222.

On Connaraceæ: *Agelaea* sp. Quezon Forest Park, Tayabas Province, Luzon, November 31, 1930, No. 439.

The strictly opposite capitate hyphopodia are characteristic. Only two species of *Meliola*, and these with alternate hyphopodia, are recorded on the Connaraceæ.

GROUP 9. Formula 3111. s. obtuse.

MELIOLA JASMINICOLA P. Hennings.

Meliola jasminicola was originally described by P. Hennings in 1895 on specimens from Hanoi, Tonkin. In this description he made no reference to the position of the capitate hyphopodia, though he did state that *M. jasminicola* was like and related to *M. polytricha* Kalchbrenner and Cooke, which later species has alternate hyphopodia. Examination of the type specimen of *M. jasminicola* shows that specimen to have alternate capitate hyphopodia. For these reasons, in the senior author's monograph, page 257, he gave the formula for this species as 3111., indicating alternate hyphopodia.

Bal states that the capitate hyphopodia are either opposite or alternate, a condition that we find in all of our specimens. The formula, therefore, should be 3113.

Mr. Willard H. Watts, who examined many collections of the senior author's Philippine material, states: "The young colonies appear to have just as many alternate and opposite hyphopodia as the older colonies. In many cases the hyphopodia were found arising only on one side of the mycelium (fig. 1). Others showed alternate and opposite hyphopodia arising on the same mycelial branch (fig. 2). No definite conclusions could be reached as to why the hyphopodia should be alternate in some parts and opposite in other parts of the same colony."

MELIOLA ALIENA Sydow.

Group number 3111.4221.

This was described by Sydow as on an unknown host. Ranger Sulit, of the School of Forestry, Los Baños, has determined the host of the type specimen for the senior author as *Pahudia rhomboidea,* one of the Leguminosæ.

The senior author is unable to identify *M. aliena* with any of the seventeen species of *Meliola* of the formula 3111. recorded as on the Leguminosæ. This, therefore, must be regarded as the eighteenth of that group.

MELIOLA SAMARENSIS Yates.

Group number 3111.4233.

This was originally reported by Yates as on an unknown host. Ranger Sulit, of the School of Forestry, says that the host is *Lepisanthes* of the Sapindaceæ. There are four species of similar formula upon the Sapindaceæ, but none seems to be identified with *M. Samarensis* which, therefore, stands as on the Sapindaceæ.

MELIOLA PSYCHOTRIAE Earle.

Group number 3111.3221.

A collection was made in Quezon Forest Park, Tayabas Province, Luzon, on *Neonauclea* which the senior author believes referable to this species. This is the first record of *M. psychotriae* in the Philippines and the first record of any *Meliola* on a *Neonauclea.*

MELIOLA EPITHEMAE sp. nov.

Colonies amphigenous, indefinite, black. Mycelium irregular, smooth, black. Spot none. Capitate hyphopodia alternate, close together. Stalk cell short, 3 to 4 μ, head cell ovate to pyriform, regular. Mucronate hyphopodia ampulliform.

Perithecial setæ none. Mycelial setæ simple, obtuse, straight, 250 to 360 μ long. Perithecia globose, smooth, 130 μ in diameter. Asci evanescent. Spores 4-septate, 26 to 30 by 10 to 11 μ.

Group number 3111.2222.

On Gesneriaceæ: *Epithema* sp. Naguilian Road, Benguet, Luzon, January 7, 1931, No. 1594.

Only two species of the formula 3111. with obtuse setæ have been noted on the Gesneriaceæ, and both of these have shorter setæ than the present species.

MELIOLA PETRAKII comb. nov.

Meliola petiolaris PETRAK, Anal. Mycol. 29 (1931) 185 non *M. petiolaris* Doidge, 1920.

Group number 3111.5432.

On Meliaceæ: *Dysoxylum cumingianum.* Type locality, Philippines.

MELIOLA ILLIGERAE sp. nov. Fig. 3, a.

Colony 1 to 3 mm in diameter, epiphyllous, black, velvety. Mycelium 8 to 9 μ thick, crooked. Spot none. Capitate hyphopodia alternate, not crowded, sometimes very distant, 170 μ. Stalk cell long, 3 to 16 μ. Head cell oblong to clavate, regular or slightly irregular, 30 by 17 μ. Mucronate hyphopodia ampulliform, small, 16 to 20 μ long.

Perithecial setæ none. Mycelial setæ 500 to 730 μ long, 10 μ thick at base, simple, obtuse, slightly curved. Perithecia globose, smooth, 160 to 175 μ in diameter. Asci evanescent. Spores 4-septate, 40 to 43 by 13 to 14 μ.

Group number 3111.3223.

On Hernandiaceæ: *Illigera luzonensis.* Naguilian Road, Benguet, Luzon, January 5, 1931, No. 1524.

No *Meliola* has heretofore been reported upon a plant of this family.

MELIOLA MELIACEARUM sp. nov. Fig. 3, b.

Colony very thin, pale, hypophyllous, 1 to 2 cm in diameter. Mycelium crooked, black, smooth, 6 to 7 μ thick. Spot none. Capitate hyphopodia alternate, scattered, far apart, often 170 μ. Stalk cell long, to 10 μ. Head cell oblong to irregular pyriform and angled. Mucronate hyphopodia ampulliform, long, to 33 μ, crooked, narrow.

Perithecial setæ none. Mycelial setæ long, to 880 μ, flexuous, simple, obtuse, very numerous near the perithecia, rare elsewhere. Perithecia globose, smooth, 160 μ in diameter. Asci evanescent. Spores 4-septate, 40 by 16 μ.

Group number 3111.3223.

On Meliaceæ: *Dysoxylum cumingianum.* Mount Maquiling, Laguna, Luzon, October 7, 1930, No. 824 (type); San Jose to Balete Pass, Nueva Ecija Province, Luzon, January 10, 1931, No. 1767.

The species is characterized by the very loose colony, the distant capitate hyphopodia, the long ampulliform hyphopodia, and the long setæ near the perithecia, which distinguish it from the numerous species of *Meliola* described as on the Meliaceæ. It differs from *M. banahaoensis,* described on *Dysoxylum,* in its

FIG. 8.

less dark, less dense colony and in setal tips. It is sparsely represented on all specimens collected and is usually accompanied by one or more other species of *Meliola* that, however, were not in determinable condition.

MELIOLA SAKAWENSIS P. Hennings.

Group number 3111.3221.

Collections were made upon *Premna subscandens* and *Symphorema luzonicum*. The latter is a new host genus, and the former a new Philippine record.

MELIOLA GARUGAE sp. nov.

Colony thin, almost invisible, hypophyllous, indefinite, 3 to 5 mm in diameter. Mycelium 6 to 7 μ thick, slightly crooked. Spot none. Capitate hyphopodia alternate, not crowded. Stalk cell short, 3 to 4 μ, head cell subglobose to ovoid. Mucronate hyphopodia ampulliform, straight or crooked.

Perithecial setæ none. Mycelial setæ very few, 140 to 250 μ long, obtuse. Perithecia globose, black, smooth, 70 to 80 μ in diameter. Asci evanescent. Spores 4-septate, 40 to 43 by 16 μ.

Group number 3111.4211.

On Burseraceæ: *Garuga abilo*. Muñoz, Nueva Ecija Province, Luzon, October 3, 1930, No. 781.

This differs markedly in mycelium, hyphopodia, and setæ from the only *Meliola* of the formula 3111. so far reported upon the Burseraceæ. No *Meliola* has heretofore been reported upon *Garuga*.

MELIOLA MICROSPORA Patouillard and Gaillard.

Group number 3111.2121.

Collection was made on Mount Santo Tomas, Benguet, Luzon, on *Leucas*, on which it has not before been reported.

MELIOLA PANICI Earle.

Group number 3111.3223.

The length of setæ in various collections varies considerably. As described, they are from 400 to 600 μ long. Most of the collections from the Philippines on *Rottboellia* fall within these limits, though collection No. 1544 had very short setæ, barely 204 μ long.

On Gramineæ: *Miscanthus*. Naguilian Road, Benguet, Luzon.

This is the first record of a *Meliola* on *Miscanthus*. This is probably *M. panici*, but all the specimens are so heavily overgrown by parasites that definite determination is impossible.

MELIOLA PTEROSPERMICOLA sp. nov. Fig. 3, e.

Colony 3 to 10 mm in diameter, epiphyllous, very thin, indefinite. Mycelium 6 μ thick, nearly straight, wine-colored, smooth. Spot none. Capitate hyphopodia alternate, not crowd-

ed, 30 to 85 μ apart. Stalk cell short, 3 to 4 μ, head cell clavate, to 23 μ long. Mucronate hyphopodia ampulliform, small, about 16 μ long.

Perithecial setæ none. Mycelial setæ simple, to 350 μ long, 9 μ thick at base, somewhat crooked, obtuse, black. Setæ from near the base of the perithecium shorter, 135 μ. Perithecia globose, smooth, 150 μ in diameter, originally flat and surrounded by radiating hyphæ, at maturity globose. Asci evanescent. Spores 4-septate, 36 to 40 by 16 μ.

Group number 3111.3221.

On Sterculiaceæ: *Pterospermum obliquum.* Agricultural College, Laguna Province, Luzon, September 10, 1930, No. 498.

Though similar to *M. pterospermi,* the only other species recorded as upon the Sterculiaceæ, in formula this differs from it in its thin, not black and dense colony and in its regular head cells as well as in length of setæ.

MELIOLA PISONIICOLA sp. nov. Fig. 3, d.

Colony 2 to 10 mm in diameter, thin, diffuse, indefinite. Mycelium 6 to 7 μ thick, somewhat crooked. Spot none. Capitate hyphopodia alternate. Stalk cell short, 3 μ, head cell subglobose to ovate. Mucronate hyphopodia ampulliform, short, thick.

Perithecial setæ none. Mycelial setæ to 185 μ long, 6 to 7 μ thick at base, simple, slightly curved, obtuse. Perithecia globose, smooth, 70 to 80 μ in diameter. Asci evanescent. Spores 4-septate, 23 by 10 μ.

Group number 3111.2111.

On Nyctaginaceæ: *Pisonia,* San Jose to Balete Pass, Nueva Ecija Province, Luzon, January 10, 1931, No. 1813.

This differs decidedly from *M. pisoniae* Stevens, which has opposite capitate hyphopodia and a very dense and black colony.

MELIOLA BRIDELIAE sp. nov. Fig. 3, e.

Colony thin, circular, 3 to 10 mm in diameter, epiphyllous, inconspicuous. Mycelium irregular, crooked, thin, 4 to 5 μ. Spot none. Capitate hyphopodia unilateral or alternate, not crowded. Stalk cell short, 2 to 3 μ, head cell cylindrical or oblong, standing out at a right angle or leaning abruptly forward. Mucronate hyphopodia ampulliform.

Perithecial setæ none. Mycelial setæ few, scattered, 580 to 800 μ long, obtuse, simple, slightly curved, 6 to 7 μ thick at base, discal setæ few, 4 to 8 at the base of each perithecium, 250 μ long. Perithecia globose, smooth, 116 to 120 μ in diameter. Asci evanescent. Spores 4-septate, 37 by 13 μ.

Group number 3111.3223.

On Euphorbiaceæ: *Bridelia stipularis.* Naguilian Road, Benguet, Luzon, January 6, 1931, No. 1543.

The colonies are very inconspicuous due to the scant mycelium loosely distributed over the leaf. Under the low power of the microscope a striking character is presented by the few long black mycelial setæ. The two forms of mycelial setæ are quite distinctive. This *Meliola* differs distinctly from all of the other species recorded upon the Euphorbiaceæ in its simple mycelial setæ of two lengths, alternate, capitate hyphopodia, and setæ more than 500 μ long.

MELIOLA SIDAE Rehm.

Group number 3111.2121.

In specimens Nos. 801, 1714, 1723, 1061, on *Sida acuta,* each perithecial disk bore upward of twelve setæ and no setæ at all were seen on the mycelium itself. The same condition we find in Fungi Malayana No. 255. In case the mycelial setæ are consistently absent, only the discal being present, the formula should be 3111.2121. If the mycelial setæ are entirely absent and the setæ around the perithecia are regarded as arising from the perithecia rather than from the disks, then the formula would be 3401.2121. and the fungus would belong to the genus *Irenopsis.* The fact that four varieties of *Irenopsis* have been described on the Malvaceæ is significant and, in view of the variability of Philippine collections of *M. sidae,* shows a close kinship between all of these forms.

MELIOLA STRYCHNICOLA Gaillard.

Group number 3111.4221.

The Philippine material has a colony that is considerably more tenuous than the senior author's own collection from Panama and there are minor differences in capitate hyphopodia, but it seems well to regard the two as identical.

MELIOLA TABERNAEMONTANAE Spegazzini.

Group number 3111.4221.

On *Tabernaemontana* sp. San Jose-Balete Pass Road, and Muñoz, Nueva Ecija Province, Luzon.

This appears to be the first record of this fungus in the Philippines.

MELIOLA MYCETIAE Stevens, sp. nov. Fig. 3, f.

Colonies amphigenous, small, 1 to 2 mm in diameter, black, of medium density. Mycelium dark, thick, 7 to 8 μ irregular to

crooked. Spot none. Capitate hyphopodia alternate, slanting forward. Stalk cell long, 6 to 8 μ, head cell ovate, regular. Mucronate hyphopodia ampulliform.

Perithecial setæ none. Mycelial setæ usually scant except near the perithecia, simple, obtuse, 190 to 205 μ long, very slightly undulate. Perithecia globose, smooth, 145 to 175 μ in diameter. Asci evanescent. Spores 4-septate, 37 to 40 by 13 to 16 μ.

Group number 3111.3221.

On Rubiaceæ: *Mycetia javanica.* Kennon Road below Camp 3, Benguet, Luzon, January 8, 1931, No. 1669.

This appears to be the first record of *Meliola* upon *Mycetia.* This species is more closely related to *M. eveae, M. ourouparíae,* and *M. psychotriae* than to the other very numerous species of the Meliolineæ that are recorded on the Rubiaceæ. Ours differs from *M. eveae* in the character of the mycelium, which in *M. eveae* is thinner and paler than in the present species. The capitate hyphopodia in *M. eveae* are also shorter.

Meliola psychotriae has mycelium and hyphopodia of lighter color. *Meliola ourouparíae* differs very decidedly in its great abundance of setæ, and in the small, nearly globose head cells. The present form differs also from each of the three mentioned above in the undulate character of the mycelial setæ.

A common character of many of the Meliolineæ occurring upon the Rubiaceæ is that the capitate hyphopodia lean forward, toward the distal end of the mycelium that bears them, making an angle of approximately 90 degrees with the supporting hypha. This character is typically shown in the present species as well as in *M. psychotriae.* Another character common to the forms on the Rubiaceæ is that the head cells are entire, usually ovate.

GROUP 10. Formula 3111. Setæ obtuse or acute.

MELIOLA CANARII Sydow.

Group number 3111.422$\frac{2}{3}$.

On Burseraceæ: *Canarium villosum.* Mount Maquiling, Laguna Province, Luzon, July 22, 1930, No. 83.

Comparison of the present collection with a specimen No. 23877 of the Philippine Bureau of Science and 363 and with Fungi Malayana No. 547 convinces us that the determination of the above specimen is correct. We note, however, three important differences between this specimen and Sydow's description.

1. Sydow describes the fungus as epiphyllous, while the present specimen shows it to be amphigenous.

2. Sydow makes no mention of deform mycelial setæ, while we find, as well as the long mycelial setæ that he describes, also other mycelial setæ which occur only near the bases of the perithecia, these setæ being few and short, 140 to 150 μ.

3. The length of the mycelial setæ is given in Sydow's description as 300 to 550 μ, while in our specimens they reach 730 μ in length and are rarely below 500 μ.

MELIOLA PIPERINA Sydow.

Group number 3111.3222.

Two species of *Meliola* of nearly the same formula—namely, *M. stenospora* Winter 3111.4222 and *M. piperina* Sydow 3111.3222—are recorded as on *Piper* in the Philippines. *Meliola stenospora* was described as with "hyphopodia promaxima parte late pyriformia, varie lobata."

Sydow says of *M. piperina*, "ausgezeichnet durch die stark gelappten Hyphopodien. Mit *M. stenospora* Wint. nächst verwandt."

The senior author is unable to examine a type specimen of *M. stenospora*, but he has specimen No. 770 of the Bureau of Science, also a Kew specimen from Uganda, determined by Miss Wakefield as this species. Comparison of these with specimens of *M. piperina* Fungi Malayana No. 367 and Bureau of Science No. 23749 shows no differences.

MELIOLA SUBSTENOSPORA v. Höhnel.

Group number 3111.4223.

On *Oplismenus undulatifolius*.

In some specimens the setæ measure up to 540 μ thus making the last figure of the formula 3 instead of 2 as is indicated by the original description. The mycelium usually parallels the veins in the way common on species growing upon grasses.

MELIOLA ICHNOCARPI sp. nov.

Colony 2 to 5 mm in diameter and circular or irregularly diffuse, spreading, thin, or coalescing and covering a large portion of the leaf. Mycelium 4 to 6 μ thick, nearly straight. Spot none. Capitate hyphopodia alternate, leaning slightly forward, not crowded, about 30 to 35 μ apart. Stalk cell short, 3 to 4 μ, head cell ovate, regular. Mucronate hyphopodia ampulliform.

Perithecial setæ none. Mycelial setæ 219 to 500 μ long, 7 μ thick at base, crooked, acute, simple. Perithecia globose, nearly smooth, 130 to 146 μ in diameter. Asci evanescent. Spores 4-septate, 30 to 33 by 13 to 14 μ.

Group number 3111.3222.

On Euphorbiaceæ: *Ichnocarpus volubilis.* Cuenca, Batangas Province, Luzon, September 28, 1930, No. 722a (type); Naguilian Road, Benguet, Luzon, January 5, 1931, No. 1465.

This species differs from *M. ramosii* in having shorter and obtuse setæ; from *M. longispora* in that the hyphopodia are ovate, not globose; from *M. gymnanthicola* and its variety in colony appearance and in setal tips; from *M. calliguajae* in its small perithecia; from *M. euphorbiae, M. sauropicola,* and *M. heveae* in setal tips; from *M. jatrophae* in its longer setæ; and from *M. morbosa* in not causing a spot.

MELIOLA MYRTACEARUM sp. nov.

Colony thin, diffuse, epiphyllous. Mycelium 6 to 7 μ thick, dark, smooth. Spot none. Capitate hyphopodia unilateral or alternate. Stalk cell short, 3 to 4 μ, head cell subglobose to pyriform or oblong, mostly oblong. Mucronate hyphopodia ampulliform.

Perithecial setæ none. Mycelial setæ 525 to 730 μ long, 7 μ thick at base, black, crooked, acute at tip. Perithecia globose, 190 μ, rough. Asci evanescent. Spores 3-celled, 40 to 44 by 16 to 17 μ.

Group number 3111.4223.

On Myrtaceæ: *Eugenia.* Mount Maquiling, Laguna Province, Luzon, January 18, 1931, No. 1946.

This species differs from the species of *Meliola* recorded as on members of the Myrtaceæ having a formula of 3111. as follows: From *M. eugeniae, M. langiera, M. hawaiiensis,* and *M. laxa* in length of setæ and in its setæ being acute. It differs from *M. psidii* and *M. brasiliensis* in many respects.

An undetermined microthyriaceous fungus was very abundant on the lower sides of the leaves.

MELIOLA GLOCHIDII sp. nov.

Colony hypophyllous, black, velvety with setæ, 5 to 10 mm in diameter. Mycelium somewhat crooked, dark, 6 to 7 μ thick. Spot none. Capitate hyphopodia alternate or unilateral, irregularly spaced. Stalk cell short, 3 to 4 μ, head cell ovoid to mostly cuneiform, regular. Mucronate hyphopodia ampulliform, narrow, short.

Perithecial setæ none. Mycelial setæ most abundant near the perithecia, very black, straight, stiff, simple, acute, 10 μ thick, usually about 250 μ long. Perithecia at first flattened, later globose, black, smooth, 100 to 120 μ in diameter. Asci evanescent. Spores 4-septate, 47 to 50 by 16 μ.

Group number 3111.4221.

On Euphorbiaceæ: *Glochidion* sp. Naguilian Road, Benguet, Luzon, January 6, 1931, No. 1561.

This differs in colony character and in hypophyllous habit from *M. ramosii,* from *M. longispora* in mycelial and setal characters, from *M. gymnanthicola* in its hypophyllous colonies and head cells, from *M. jatrophae* in hyphopodia, and from *M. morbosa* in spot character.

MELIOLA EUCALYPTI sp. nov.

Colony to 14 mm in diameter, irregular, black, amphigenous. Mycelium 6 to 7 μ thick, almost straight. Spot none. Capitate hyphopodia alternate, not crowded, but close, about 17 μ apart. Stalk cell short, 3 to 4 μ; head cell oblong, regular or slightly irregular. Mucronate hyphopodia ampulliform, numerous, mostly opposite.

Perithecial setæ none. Mycelial setæ very few, 200 to 220 μ long, 9 to 10 μ thick at base, black, simple, acute. Perithecia globose, smooth. Asci evanescent. Spores 4-septate, 40 to 43 by 16 to 17 μ.

Group number 3111.4211.

On Myrtaceæ: *Eucalyptus.* San Jose to Balete Pass, Nueva Ecija Province, Luzon, January 9, 1931, No. 1722.

This differs markedly from all species of *Meliola* of formula 3111. recorded on the Myrtaceæ and from all species recorded on *Eucalyptus.*

MELIOLA BANOSENSIS Sydow.

Group number 3111.3223.

On Leguminosæ: *Spatholobus gyrocarpus.* Mount Maquiling, Los Baños, Laguna Province, Luzon, September 13, 1930.

No *Meliola* has heretofore been recorded upon this host. Though the setæ in our specimen in general are longer than in Sydow's specimen and as indicated in his description, it appears well to regard the two specimens as of the same species.

MELIOLA PIPERINA Sydow.

Group number 3111.3222.

Collections were made on *Piper betle* on which species of host it has not previously been reported.

MELIOLA BARRINGTONIICOLA sp. nov. Fig. 3, h.

Colony 1 to 3 mm in diameter, black, moderately dense, epiphyllous, mycelium 6 to 7 μ thick. Spot none. Capitate hyphopodia alternate or partly unilateral. Stalk cell short, 3 to 4 μ, head cell subglobose. Mucronate hyphopodia ampulliform.

Perithecial setæ none. Mycelial setæ to 450 μ long, 9 to 10 μ thick at base, simple, acute, mostly near the center of the colony. Perithecia globose, smooth, 120 μ in diameter. Asci evanescent. Spores 4-septate, 40 by 17 μ.

Group number 3111.3222.

On Lecythidaceæ: *Barringtonia* sp. Quezon Forest Park, Tayabas Province, Luzon, November 30, 1930, No. 440.

This is quite distinct from *M. indica*, the only species recorded on this family, in not having the capitate hyphopodia opposite.

MELIOLA PARENCHYMATICA Gaillard.

Group number 3111.4232.

Four collections from Luzon agree with a specimen from the Bureau of Science and with Fungi Malayana No. 365, the distinguishing character being the irregular shape of the head cells. The original description gives the head cells as globose or ovoid and does not mention the irregularity, which in the Philippine specimens is strongly pronounced.

Genus MELIOLINOPSIS Beeli

MELIOLINOPSIS UVARIAE (Rehm) Beeli.

Group number 2111.4132.

Our specimens collected in Laguna agree precisely with the type specimen, but since neither possesses perithecia, the determination is questionable.

Numerous of the senior author's Meliolineæ collections are undeterminable due to such overgrowth by parasites as to prevent proper development of perithecia, setæ, etc., or to scanty collections which did not give the requisite characters for description.

It is obviously unwise to publish these with full descriptions and names, but since many of them represent new records on genera or families, it seems desirable to make record of their existence with a very brief description. In such cases the forms are designated by numbers, as follows:

No 1.—Colony 1 to 5 mm in diameter, diffuse. Capitate hyphopodia alternate, about 16 μ apart, head cells oblong.

On Ericaceæ: *Vaccinium benguetense.*

This is clearly not *I. exilis* or *I. andromedae.*

No. 2.—Capitate hyphopodia alternate. Head cell subglobose to ovate, regular.

On Thymelaeaceæ: *Wikstroemia.* Paete, Laguna Province, Luzon.

Only two species of the Meliolineæ are recorded on this family and neither of these from the Philippines.

No. 3.—Capitate hyphopodia alternate, head cell oblong or irregular, mycelial setæ 400 to 600 μ long, simple.

On Anacardiaceæ: *Semecarpus* sp. Mount Maquiling, Laguna Province, Luzon, No. 1921.

This is a very characteristic form. It is not *M. semecarpi,* the only species recorded on this family from the Philippines, which has longer setæ and many fewer capitate hyphopodia.

No. 4.—Capitate hyphopodia alternate, head cell irregular.

On Pandanaceæ: *Pandanus* sp. Louisiana, Laguna Province, Luzon, September 21, 1930, No. 676.

No species of the Meliolineæ has hitherto been recorded on the Pandanaceæ in the Philippines, though one species, *M. pandani,* is recorded from Borneo which is perhaps identical with this number.

No. 5.—Capitate hyphopodia alternate, head cell subglobose to slightly irregular, very regularly spaced, colony very thin.

On Sterculiaceæ: *Pterospermum niveum.*

No species is recorded on this host from the Philippines, only four species are recorded for this family in the world.

No. 6.—Capitate hyphopodia alternate, head cell ovate, regular.

On Anonaceæ: *Papualthia lanceolata.* Mount Maquiling, Laguna Province, Luzon.

Though numerous species are known on the Anonaceæ, none has heretofore been noted upon this genus. It was collected on Mount Maquiling several times but in all cases very heavily overgrown by a *Helminthosporium,* so heavily that the presence or absence of setæ could not be determined nor did perithecia develop.

No. 7.—Capitate hyphopodia numerous, alternate, head cell oblong or irregular, perithecia globose, smooth, colony dense.

On Sapotaceæ: *Palaquium* sp. Mount Maquiling, Laguna Province, Luzon.

No. 8.—Capitate hyphopodia few, distant, mycelial setæ more than 1,100 μ long, perithecia smooth, globose, colony very thin.

On Sapotaceæ: *Palaquium* sp. Mount Maquiling, Laguna Province, Luzon.

Nos. 7 and 8 occurred upon the same leaves but were too scant to be determined. They certainly are two very different species and differ from *M. palaquii,* the only Meliola that has been

recorded on *Palaquium*. None on the Sapotaceæ has setæ as long as those of No. 7.

No. 9.—Capitate hyphopodia alternate, head cell clavate, irregular, colony thin.

On Urticaceæ: *Oreocnide* sp. Acop's, Benguet Subprovince, Luzon.

No *Meliola* has been recorded on *Oreocnide*.

No. 10.—Capitate hyphopodia alternate, head cell clavate, irregular, mycelium crooked, mycelial setæ probably absent.

On Vitaceæ: *Leea philippinensis*. Mount Maquiling, Laguna Province, Luzon.

No *Meliola* has been recorded on this host.

No. 11.—Capitate hyphopodia alternate, head cell ovoid, regular, mycelium very crooked.

On Gesneriaceæ: *Isanthea discolor*. Balete Pass, Nueva Ecija Province, Luzon.

None has been recorded on this genus.

No. 12.—Capitate hyphopodia alternate, head cell ovate, mycelial setæ few, 80 to 90 μ long, obtuse.

On Compositæ: *Elephantopus*. Balete Pass, Nueva Ecija Province, Luzon.

None has been recorded on this genus from the Philippines.

No. 13.—Capitate hyphopodia alternate, head cell cuneiform or angular, mycelium crooked.

On Euphorbiaceæ: *Neotrewia cumingii*. Mount Maquiling, Laguna Province, Luzon.

No *Meliola* has been recorded upon this genus.

No. 14.—Capitate hyphopodia alternate, head cell ovate, regular, mycelial setæ long, to 500 μ, simple.

On Tiliaceæ: *Grewia*.

No *Meliola* has been recorded upon this host genus hitherto.

No. 15.—Capitate hyphopodia alternate, head cell ovate, regular.

On Proteaceæ: *Helicia* sp.

No *Meliola* has ever been reported on *Helicia*.

No. 16.—Capitate hyphopodia opposite, head cell conic-cylindric, mycelial setæ simple, to 450 μ long.

On Meliaceæ: *Dysoxylum*. San Jose to Balete Pass, Nueva Ecija Province, Luzon.

No. 17.—Capitate hyphopodia alternate, head cell very large and irregularly lobed.

On Symplocaceæ: *Symplocos.* Mount Maquiling, Laguna Province, Luzon.

No *Meliola* has been recorded for this family except the very questionable *M. amphitricha,* which in any event could not be the present species.

No. 18. Fig. 3, i.—Colony circular, epiphyllous, 3 to 7 mm in diameter, usually heavily covered by an *Arthrobotryum* and sometimes by a *Helminthosporium* as well. Mycelium smooth, 6 to 7 μ thick, loosely distributed; that is, not dense. Spot none. Capitate hyphopodia alternate. Stalk cell short, 2 to 3 μ, head cell rarely subglobose, usually irregularly angled. Mucronate hyphopodia ampulliform.

Perithecial setæ, mycelial setæ, perithecia, and spores not seen.

On Chloranthaceæ: *Chloranthus officinalis.* Mount Maquiling, Laguna Province, Luzon.

No species of *Meliola* has heretofore been recorded on any member of the Chloranthaceæ; though the present species was collected many times on Mount Maquiling at different elevations, in no instance was even a single colony seen that was not heavily overgrown by an *Arthrobotryum,* so heavily indeed that the *Meliola* mycelium was almost completely obscured and setæ and perithecia were entirely suppressed. A rather extraordinary feature of these colonies is that occasionally in the midst of mycelial strands that are heavily parasitized are a few that are not parasitized at all. The dense sheathing of the *Meliola* by the *Arthrobotryum* mycelium is very characteristic and it is only in rare bits that the *Meliola* mycelium and its hyphopodia can be seen.

In the absence of the usual *Meliola* characters, the chief distinctive character of this species is that of its being so heavily parasitized, and its host relation. The fact that this *Meliola* is so heavily parasitized, while most other species of *Meliola* in the vicinity are not, is strong evidence of the biologic specialization of these fungi growing parasitic on *Meliola.*

ILLUSTRATIONS

TEXT FIGURES

FIG. 1. Species of *Meliola*, *Irenopsis*, and *Irenina*.

a. *Meliola saurauiae* sp. nov., mycelium habit, low power, mycelium showing detail, and spore, high power.

b. *Irenopsis benguetensis* sp. nov., mycelium showing capitate and mucronate hyphopodia, high power.

c. *Irenina acalyphae* sp. nov., mycelium showing capitate and mucronate hyphopodia, high power.

d. *Irenina rubi* sp. nov., mycelium showing habit, low power, and mycelium showing capitate and mucronate hyphopodia, high power.

e. *Irenina rubi* Stevens var. *angulata* var. nov., mycelium showing capitate and mucronate hyphopodia, high power.

f. *Irenina angustispora* sp. nov., mycelium showing habit, low power, and mycelium showing capitate hyphopodia, high power.

g. *Irenina callicarpae* sp. nov., mycelium showing habit, low power, and mycelium showing capitate hyphopodia, high power.

h. *Irenina thunbergiae* sp. nov., mycelium showing capitate and mucronate hyphopodia, high power.

i. *Irenina sinuesa* sp. nov., mycelium showing capitate and mucronate hyphopodia, high power.

2. Species of *Meliola*.

a. *Meliola palaquii* sp. nov., mycelium showing capitate and mucronate hyphopodia, high power.

b. *Meliola micromeli* sp. nov., mycelium showing capitate and mucronate hyphopodia, high power, and setæ showing apices, high power.

c. *Meliola benguetensis* sp. nov., mycelium showing capitate and mucronate hyphopodia, high power, and setæ showing teeth, high power.

d. *Meliola pistaciae* sp. nov., mycelium showing capitate and mucronate hyphopodia, high power, and setæ showing teeth, high power.

e. *Meliola themedae* sp. nov., mycelium showing capitate and mucronate hyphopodia, high power, and seta showing tip, high power.

f. *Meliola nepheliicola* sp. nov., mycelium showing capitate and mucronate hyphopodia, high power, and setæ showing apices, high power.

g. *Meliola symphoremae* sp. nov., mycelium showing capitate and mucronate hyphopodia, high power.

h. *Meliola pisoniae* sp. nov., mycelium showing capitate and mucronate hyphopodia, high power.

i. *Meliola rubi* sp. nov., mycelium showing capitate and mucronate hyphopodia, high power.

3. Species of *Irenopsis* and *Meliola.*

a. *Meliola illigerae* sp. nov., mycelium showing capitate and mucronate hyphopodia, high power.

b. *Meliola meliacearum* sp. nov., mycelium showing capitate and mucronate hyphopodia, high power.

c. *Meliola pterospermicola* sp. nov., mycelium habit, low power, and mycelium showing capitate and mucronate hyphopodia, high power.

d. *Meliola pisoniicola* sp. nov., mycelium showing capitate and mucronate hyphopodia, high power.

e. *Meliola brideliae* sp. nov., mycelium showing capitate hyphopodia, high power.

f. *Meliola mycetiæ* sp. nov., mycelium showing habit, low power, and setæ showing undulations, high power.

g. *Meliola agelaeae* sp. nov., mycelium showing capitate and mucronate hyphopodia, high power.

h. *Meliola barringtoniicola* sp. nov., mycelium showing capitate and mucronate hyphopodia, high power.

i. *Meliola* 18, mycelium showing capitate hyphopodia, high power.

j. *Irenopsis coronata* var. *philippinensis* var. nov., mycelium showing habit, low power, and mycelium showing capitate and mucronate hyphopodia, high power.

k. *Meliola ganophylli* sp. nov., mycelium showing capitate and mucronate hyphopodia, high power, and setæ showing apices, high power.

l. *Meliola andropogonis* sp. nov., mycelium showing capitate hyphopodia, high power.

ETHNOGRAPHIC STUDY OF THE YOGADS OF ISABELA

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THREE PLATES

INTRODUCTION

Many ethnographic studies on the different Philippine groups have been undertaken by eminent anthropologists and scientists, yet the Yogads have never been given proper attention, perhaps because of their small number and the similarity of their characteristics to those of the Gaddangs and the Ibanags. The literature references available on the group are very limited, being confined to their dialect, geographic location, and their relation to other ethnic groups. Blumentritt in 1890 only mentioned their geographic location and their relation to the Christianized Gaddangs. Pardo de Tavera in 1901 analyzed the etymology of their tribal name. Worcester in 1906 mentioned them as a part of the Christianized Kalingas of western Isabela. Malumbres in 1918 likewise mentions their geographic location and the relation of their dialect to the Gaddangs. The present writer attempts to present in this short paper a study of their economic and social life, and their dialect. In 1931, when he was officially sent to Isabela and Nueva Vizcaya Provinces to purchase museum specimens, he stayed with this group long enough to become acquainted with it; and, having been given the necessary facilities for ethnographic study, he was able to familiarize himself with the economic and social life of the Yogads, and the peculiarities of their dialect. These studies form the subject of the present discussion.

ORIGIN

The term Yogad, or Iogad, is derived from *ugad*, an Ibanag word meaning elevated garden patches or seed plots.

Se conoce con el nombre de *yogades* (yogad ó *gaddanes* a unos montañeces que en la actualidad habitan en las vertientes de la cordillera central, límite occidental de la provincia de la Isabela, desde la orilla izquierda del Río Magat, término del Río Mercedes, hasta la jurisdicción de los pueblos cristianos de Itawes.

La etimología de ambos nombres nos la da la lengua ibanag que tanto se parece al gaddan, resultando que *gaddan* y *yogad* tienen la misma significación y origen, sólo que el primero es nombre de *lugar* y el segundo de *tribu*. Ambos derivan del radical *gad* cuya forma más antigua *ugad*, existe también en ibanag y significa "sementera alta". Esta raiz, seguida del sufijo *an*, quiere decir "lugar de la sementera alta" como *payaw* vimos que quería decir "sementera baja o de regadío". Los habitantes del *gaddan*, llamados hoy así con este nombre propio de personas, que es *yogad* formado con el prefijo *i* cuyo significado conocemos y el radical *ugad* igual a *gad* que hemos examinado.[1]

It is said that the Yogads, who regard themselves as offshoots of the Ibanags, originally came from the town of Enrile, formerly called Cabug, which was established in 1742 in Cagayan Province. Due to the crowded conditions of their native town and the difficulties encountered in the struggle for existence, this sturdy, peace-loving, and adventurous people decided to migrate to Isabela Province, to find a new home and to seek their fortune.

Worcester[2] states that the Yogads are a part of the Christianized Kalingas of western Isabela. These Kalingas are called Gaddangs, and were Christianized by missionaries.

GEOGRAPHIC DISTRIBUTION

The Yogads were at one time confined to the level land of the town of Difun, which was established in 1706. The principal towns which they now occupy are Camarag, the oldest town in Isabela, established in 1753, and Echague, Angadanan, Santiago, and Jones, formerly Cabanuangan.

POPULATION

The present number of the group speaking the Yogad dialect is conservatively estimated at 8,000. This number represents those who are regarded as being of pure stock. A few of them have migrated to neighboring provinces where they intermarried with the other Christian groups.

PHYSICAL TYPE AND CHARACTERISTICS

The Yogads are predominantly of the Indonesian type with a slight admixture of Negrito and Chinese blood. They vary from reddish brown to dark brown in complexion. They are round-headed, with straight, black hair, dark brown eyes, and a nose

[1] Pardo de Tavera, T. H., Etimología de los Nombres de Razas de Filipinas. Manila (1901) 14.

[2] Philip. Journ. Sci. 1 (1906) 818.

of medium breadth with a low bridge. They are of ordinary size and have unusually regular features. Like other Philippine peoples, they are practically beardless.

CULTURE

The Yogad culture, like that of the other Christian groups of the lowlands, is tinctured by Spanish civilization, although the people retain many of their primitive customs and beliefs.

ECONOMIC LIFE

Agriculture.—Formerly the Yogads practiced the kaiñgin system of agriculture, planting in cleared forest areas where the soil is loose and fertile. Under this system the small trees and shrubs are cut away and burned, and the large trees are killed.

According to the census of 1918 the climate of the plains occupied by the Yogads is very favorable to the growth of tobacco. The northeast monsoons bring heavy rains, which wash down the fertile mountain soil into the rivers that deposit the silt on the plains. In this manner the tobacco fields are fertilized every year.[3]

The principal product is tobacco, which is grown in large quantities. The variety of tobacco raised in this region is considered one of the best in the Philippines, and, as one of the principal articles of export, constitutes the wealth of the people. The corn crop is the object of considerable care on the part of the natives, as it constitutes their principal food supply when the price of rice is high. Rice, sugar cane, coconuts, and coffee, grow almost without the care of the planter. A few cattle are raised. The forests are rich in valuable timber, such as molave, ipil, narra, and camagon.

Hunting and fishing.—Hunting is carried on to a considerable extent. Wild pigs, carabaos, and deer are caught with snares, traps, and barbed spears that are similar to those of the Bontoc Igorots. The Sierra Madre Mountains are the hunting places of the Yogads.

Cagayan River has an abundant supply of fish, and fishing is one of the principal occupations of the people. Fish are caught with nets, lines, and traps, as well as with small barbed spears, and bows and arrows. Murrel fish constitute the principal catch.

Basketry.—The Yogads do considerable basket work. The principal materials used are bamboo, rattan, and nito. Four

[3] Census of the Philippine Islands: 1918 1 (1920) 167.

types of weave are employed; namely, "in and out" or cloth weave, twilling or sawale weave, hexagonal weave, and coiling. Some of their baskets are patterned after those of the Ilocanos and pagan tribes of northern Luzon.

Weaving of textiles and the making of pottery are unknown among the Yogads, who purchase most of their clothing from Ilocano and Chinese traders, and their pots and stoves from the Tinggians and Ilocanos.

Transportation.—The Yogads have transportation by land and water. Their typical land transportation is the cart drawn by a carabao or cow. Riding on horseback is also common on mountain trails.

Their typical water transportation is the raft, or *gakit*, and the dugout canoe, or *abáng*. The gakit, which is about 6 meters long, is made of mountain cane, or *buhu*, lashed together by rattan. It is used for transporting across Cagayan River mature tobacco leaves placed in big baskets called *tangkal*. The dugout canoe is used for fishing and passenger transportation.

Dwelling.—The Yogad dwelling is a structure of wood, bamboo, or mountain cane, with a thatched or bamboo roof. This kind of roofing, or *camá*, must be in imitation of the Ilocanos who commonly use it in roofing their houses. The sides or walls are made of sawale or mountain cane split into halves, which are placed so as to overlap one another. The floor is made of wood, sawale, or bamboo. The houses have only one partition and are raised 3 to 4 feet above the ground.

Dress and ornaments.—Yogad dress is similar to that of other Christian groups. The men wear shirt and trousers and the women camisa and skirt.

Yogads are not much given to personal ornamentation. Some of the men have tattoo marks on the arms and hands. Necklaces of beads and coconut shells, earrings, and finger rings are also worn to some extent.

SOCIAL LIFE

Music.—The Yogads, like the other Christian Filipinos, are very fond of music. Social gatherings and entertainments are always marked by singing and dancing.

The typical musical instrument of the Yogads is the *cinco-cinco*, a small five-stringed wooden guitar, which is used to accompany songs and dances. Other musical instruments are the *tal-lelet* and the *caralat*, or bamboo rattles. These are percussion bamboo musical instruments, which are played at night

during Holy Week. A band contest for these musical instruments is held by the different barrios at a designated place.

Dances.—The Yogads have four typical dances; namely, *mascota, a la jota, laurente,* and *balamban.* The first three dances are similar to each other although the music differs. They are danced, to the accompaniment of a cinco-cinco or an accordion, by a man and a woman facing each other. The rhythmic movement of the hands is emphasized. The balamban is also danced to particular music by a man and a woman, with special emphasis on the rhythmic movement of the feet. The name of this dance originated from the name of a long fish, called balamban, that jumps in the water.

Circumcision.—The Yogads, like some of the other Christian groups, practice circumcision. The boys are usually circumcised at twelve to fourteen years of age. The foreskin or prepuce of the penis is split with a sharp knife. Young guava leaves are masticated and the sap is applied as medicine. It takes ten to fifteen days to heal the wound. This practice is called *banguit.*

Marriage customs.—Generally speaking, the Yogads prefer to marry among themselves. They seldom intermarry with other Christian groups.

Formerly it was customary for the parents to make arrangements for the marriage of their children. Now it is left to the discretion of the boy and the girl. As soon as the boy wants to marry, his parents together with a spokesman go to the girl's parents and ask for her hand. They bring with them a drink, usually gin.

On the third day the spokesman of the boy's parents is told to come again to the house of the girl for the decision of the girl's parents. If the decision is favorable, the parents and relatives of both parties meet on the third day to make the final arrangement for the wedding.

Then the *landai* takes place. This is a feast prepared by both parties prior to the real wedding feast. A sort of poetical joust between the representatives of the boy and the girl usually takes place. While the contest is being held, the girl prefers to stay in the kitchen. The representative of the girl usually yields to the representative of the boy and then they all partake of the feast.

A band of music usually follows the bride and the groom on their way to the church where the wedding ceremony is to be performed.

After the wedding, the friends and relatives of the couple are entertained with a dance. Then follows what is called *gala*, or the giving of money to the couple. Two plates, one for the bride and the other for the groom, are placed on the table. The relatives of the bride and the groom put their money on the respective plates of the couple.

After the gala, the so-called *dal-lut* takes place. Only the relatives of both parties take part. It is usually performed at 3 or 4 o'clock in the morning. Some of the male relatives join their hands and some of the female relatives do the same. The male relatives of the couple are allowed by common consent to kiss the female relatives without holding them. After the dal-lut the girl goes to the parents of the boy, and the boy to the parents of the girl. Then they live together as husband and wife.

Superstitious beliefs.—The Yogads are a very superstitious people, especially those who live in Barrio Capitan, Echague. They believe in evil spirits, and the *Anitos*, who are said to cause sickness, which, however, may be cured by an *anting-anting*, or amulet.

The *caraŋgat*, or evil spirits, dwell in certain places, such as bamboo, *balete*, and *andarayan* trees. When a person gets sick, an old man called *maguimun* is summoned to find out whether the sickness is caused by the evil spirits. He asks the sick person where he went or played to ascertain the cause of his sickness. If the sickness is caused by the evil spirits, he takes little pieces of buyo, rolled tobacco leaves, rice (*malagquit*) placed in a coconut shell, and a white chicken and goes to the dwelling place of the spirits. He communes with the spirits, shouting at them and telling them to leave the sick person and to return to their dwelling places for he has prepared food for them. If the sickness of the person is very severe, the maguimun cuts the left leg of the chicken and the right leg is tied with a cotton thread. Then he anoints the forehead of the sick person with the chicken's blood. It is believed that the sickness will be cured in this manner.

The *mag-anito* is another common superstitious belief among the Yogads. They go to the forest for three days' festival during the dry season, taking with them pigs and rice. The *maponags*, or women mediums, are the ones who commune with the anitos. Part of the pigs is offered to the anitos, and the rest is cooked for the members of the party. The share offered to the anitos is usually given to the maponag. This yearly three-

day festival has to be repeated seven times. It is believed that after seven years the members of the party will be immune from sickness caused by the anitos. During these seven years, the members are not allowed to eat sugar and garlic. Only salt is allowed to be used in their food; nor are they allowed to repair their houses or use a white blanket or curtain.

Burial ceremony.—Before burial, a white handkerchief is spread on the face of the dead person. Then those present pray and leave the dead, except for the one who is to remain to hold the four corners of the handkerchief. As soon as the latter believes that the spirit of the dead is already in the handkerchief, he takes it home and walks around the house. It is believed that on the third day the spirit of the dead will visit them and stay only under the house if such a ceremony is not performed.

The members of the family are not allowed to stoop or look down when the coffin is being lowered into the grave, for it is the belief of the Yogads that he who looks down will also die.

After burying the dead, the members of the family wash their hands and faces with water mixed with burned straw.

For nine nights they pray for the spirit of their dead, every night offering food to the spirit.

DIALECT

The Yogad dialect resembles quite closely Ibanag and Gaddang. Malumbres [4] states that the Yogad dialect is but modified Gaddang. The Yogads have a peculiar intonation in speaking. They say their prayer in Ibanag. They have no printed literature or periodicals.

It has been observed that the majority of the Philippine dialects lack labial fricatives.[5] However, this is not true in the case in the Yogad dialect. Like Ibanag and Gaddang, it possesses the surd aspirant *f*, a sound which is very common in this dialect. The original *p* becomes *f* when it is immediately followed by *u*. For example, fire, *afuy;* leg, *uffu;* heart, *futú;* ten, *tafulu.* Judging from the material at hand, the sonant aspirant *v* is not used in the Yogad dialect. The original *b* is persistent. For example; moon, *bulan;* pig, *buhay;* thousand, *taribu.*

[4] Historia de Cagayán. Manila (1918) 14.

[5] Conant, C. E., "F" and "V" in Philippine languages, Philippine Ethnological Publications 5 (1908) 135.

LEXICAL COMPARISON

I have selected some of the commonest terms from the work of Otto Scheerer [6] to show the affinity of the Yogad dialect to its sister groups of dialect.

Common terms showing the affinity of Yogad to Ibanag and Gaddang.

English.	Yogad.	Ibanag.	Gaddang.
sky	langít	langi-t	langit
sun	igao	aggau matá tal lángui-t	sinag
moon	bulán	bulán	bulan
night	gabi	gabí	gafi
star	bitun	bitún	bitun
fire	afuy	afuy	áfuy
water	danum	danúm	dánum
name	ngagan	ngagan	ngan
man	lalaqui	tolay	tolay
father	ama	ama	ama
woman	babai	babay	bafay
mother	ina	iná yéna	ína
brother	oagui	uagui	uaii
head	ulú	ulú	ulu
face	muguing	mutúng	mutung
nose	igung	igung	iyung
mouth	labi	simu-t	labi
lip	bibig	bibíg	bifig
tongue	dilá	jila	dila
tooth	ñgipan	ñgipan	ñgipan
eye	mata	matá	mata
ear	bambang	talínga	layag
neck	lig	bul-lao	lig
heart	futu	futú puto jutú	futu
belly	san	san	gan
knee	tud	tuad dulúng	tuud
leg	úffu	uffú	uffu
foot	ták-ki	takké	takki
nail	cucu	cucú	cucu
flower	lap-pao	lappau	lappao
root	gammút	gammu-t	gámut
dog	atú	itu kitu	átu

[6] Scheerer, Otto, the Batán dialect as a member of the Philippine group of languages, Philippine Ethnological Publications 5 (1908) 22.

Common terms showing the affinity of Yogal to Ibanag and Gaddang—Ctd.

English.	Yogad.	Ibanag.	Gaddang.
egg	ilug	il-lug	iluk
fish	ikán	sirá	sira
pig	babúy	babuy	bafuy
goat	gánding	kajjing	ganding
snake	irao	iráu	irao
deer	út-ta	uttá	ut-ta
house	binalai	baláy	bálay
bridge	taletai	talétay balatay	tét-ay
hunger	bisin	bisin	bisin
thirsty	nauwa-wan	pangál	nauwa-wan
sickness	taquit	takí-t	taquit
one	inté	tádday	tátta
two	addué	duá	ádua
three	tal-lu	tal-lú	tallú
four	appát	appá-t	appat
five	limá	lima	lima
six	an-nám	annám	annám
seven	pitú	pitú	pitu
eight	oalú	oalú	uálu
nine	isiám	siám	isiam
ten	táfulu	mafulú	tafúlu
eleven	táfulu tatta	karattadday	tafúlu tátta
twenty	aduáfulu	duá fulu	aduáfulu
one hundred	tágatut	magatú-t	tátut

From the common terms mentioned above, it is evident that the Yogad dialect closely resembles Ibanag and Gaddang. In Yogad and Ibanag the accent appears frequently on the second syllable of the word. For example:

English.	Yogad.	Ibanag.
moon	bulán	vulán
star	bitún	bitún
head	ulú	ulú
heart	futú	futú
root	gammút	gammú-t
four	appát	appá-t
seven	pitú	pitú

Words not marked by an accent, are pronounced as in Yogad and Ibanag. For example:

English.	Yogad.	Ibanag.
belly	san	san
nail	cucu	cucu
hunger	bisin	bisin

In the Gaddang dialect the accent frequently appears on the first syllable of the word. For example:

English.	Gaddang.
fire	áfuy
man	tólay
child	ánac
head	úlu
eye	máta
leg	úffu
nail	cúcu
dog	átu
fish	síra
bridge	tétay
sickness	táquit
one	táta
two	ádua
seven	pítu
one hundred	tátut

It is evident that the Yogad and Ibanag dialects have the same intonation in speaking, while that of the Gaddang is different.

SUMMARY

The Yogads belong to the group of Ibanag emigrants who settled in Isabela Province to improve their economic life. Their physical characteristics resemble those of the Christian Gaddangs living in Magat River Valley. Their social life is quite distinct, for they retain many of their primitive customs and beliefs. Their dialect resembles quite closely the dialect groups spoken in Cagayan Province, the home of the Ibanag people.

ILLUSTRATIONS

PLATE 1

FIG. 1. A typical Yogad house (*binalai*). Its walls are made of split mountain bamboo strips placed so as to overlap one another.
2. The sledge basket (*tangkal*) used for hauling mature tobacco leaves.

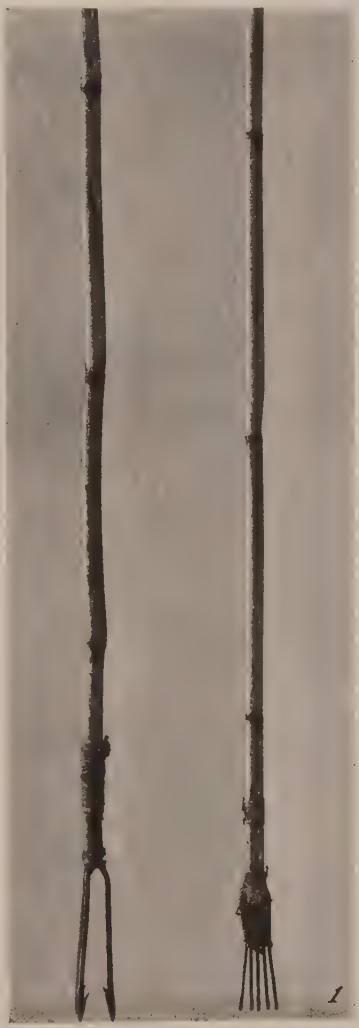
PLATE 2

FIG. 1. Typical fish spears of the Yogads.
2. The circumcision instrument (*pag-banguit*).

PLATE 3

FIG. 1. The bamboo rattle (*tal-lelet*).
2. The five-stringed wooden guitar (*cinco-cinco*).

PLATE 1.



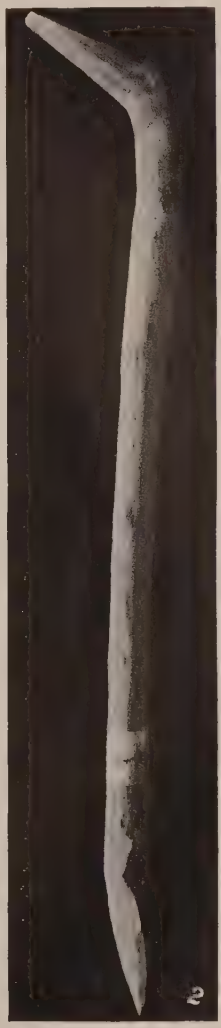


PLATE 2.

1

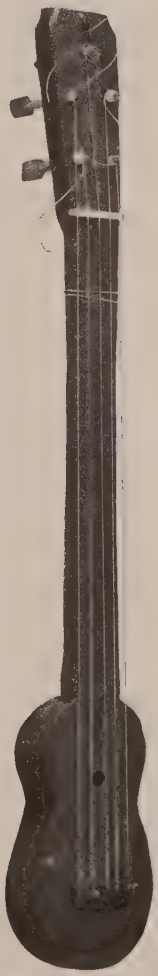


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PLATE 3.

NEW BIRDS FROM NORTHERN LUZON, PHILIPPINE ISLANDS

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ONE PLATE

Two birds in the ornithological collection of the Bureau of Science attracted my attention. One proved to be a new subspecies of *Cyornis*. The other is a female of *Prionochilus anthonyi* McGregor; the type of this dimorphic species is a male.[1]

CYORNIS BANYUMAS MCGREGORI subsp. nov. Plate 1.

Type—Female, No. 13347 Bureau of Science collection; Mount Cresta at 800 meters, Cagayan Province, Luzon, Philippine Islands, April 6, 1929; collected by Francisco Rivera.

Subspecific characters.—Upper surface resembling that of *C. lemprieri* (Sharpe), of Palawan, Balabac, and the Calamianes, more than that of any other species. However, the brownish olivaceous [2] tinge is more uniform throughout the upper surface than in *C. lemprieri*. Color of underparts distinct from that of *C. lemprieri* in not having white on chin and possessing lighter orange-buff on throat and upper breast. This subspecies also differs from *C. lemprieri* in the length of wings and tail. The remaining four complete feathers of the mutilated tail are shorter than any of the tail feathers of *C. lemprieri* from Puerto Princesa and Tanabog, both in Palawan, that were examined.

This subspecies differs from *C. beccariana simplex* Blyth of Luzon and Marinduque in having no blue on the upper parts. Robinson and Kinnear [3] however, are of the opinion that the blue color of the upper surface shows a "considerable general variation." Tawny-olive band on forehead absent in *C. b. simplex*. Undersurface distinctly lighter.

In accordance with the characters laid down by Chaseen and Kloss [4] for the *banyumas* group, "*crown and back brown, or*

[1] Philip. Journ. Sci. § D 9 (1914) 531.

[2] Colors are from Robert Ridgway, Color Standards and Color Nomenclature. Washington (1912).

[3] Nov. Zool. 34 (1928) 231–261.

[4] Bull. Raffles Mus. No. 2 (1929) 23–42.

grey-brown, in females; tail either brown or particolored blue and brown," this bird is considered a new form of this group with its range in the highlands of northern Luzon.

Description.—A band of tawny-olive on forehead, which gradually disappears over each eye; crown and hind neck deep grayish olive; back and greater coverts dark citrine, basal half of these feathers grayish brown; rump [5] dark citrine; upper tail coverts Sudan brown; tail Sanford's brown; primaries and secondaries blackish brown, their outer webs with snuff brown edges; tertiaries olive-brown. Chin, throat, and fore breast orange-buff, becoming brownish buff on breast; abdomen with a circular patch of grayish white, about 20 millimeters in diameter; flanks dark citrine. Under tail coverts (mutilated) grayish white. A pair of loral bristles white.

Wing, 78 millimeters; culmen from nostril, 11; tarsus, 18.

This subspecies is named for Mr. Richard C. McGregor, ornithologist of the Philippine Government, who, for the last thirty-three years, has contributed much to the knowledge of the Philippine avifauna.

PRIONOCHILUS ANTHONYI McGregor.

Type of female.—No. 28514 Bureau of Science collection; Mount Tabuan, at about 1,500 meters, Cagayan Province, Luzon, Philippine Islands, May 18, 1929; collected by Francisco Rivera.

Entire upper surface and sides of head olive-green, which is more intense on back, rump, and upper tail coverts. Primaries and secondaries dark brown with little olivaceous gloss. Outer webs of quills with olive-green margins, those of the inner webs light brown. Primary coverts dark brown, other coverts olive-green. Chin sparsely covered with antrorse white feathers; throat gray; sides of breast yellowish citrine; sides of abdomen and thigh olive lake; a line of primuline yellow along middle breast and abdomen, including entire under tail coverts.

Bill black above and matt ivory yellow below; legs, feet, and claws Brussels brown; soles pale yellow, same as in male.

Length, 87 millimeters; wing, 59; culmen, 10; tail, 29; tarsus, 16.

The mate (Bureau of Science collection, No. 28513) of this female was also obtained.

[5] Parts are mutilated.

ILLUSTRATION

PLATE 1. *Cyornis banyumas mcgregori* subsp. nov., female.

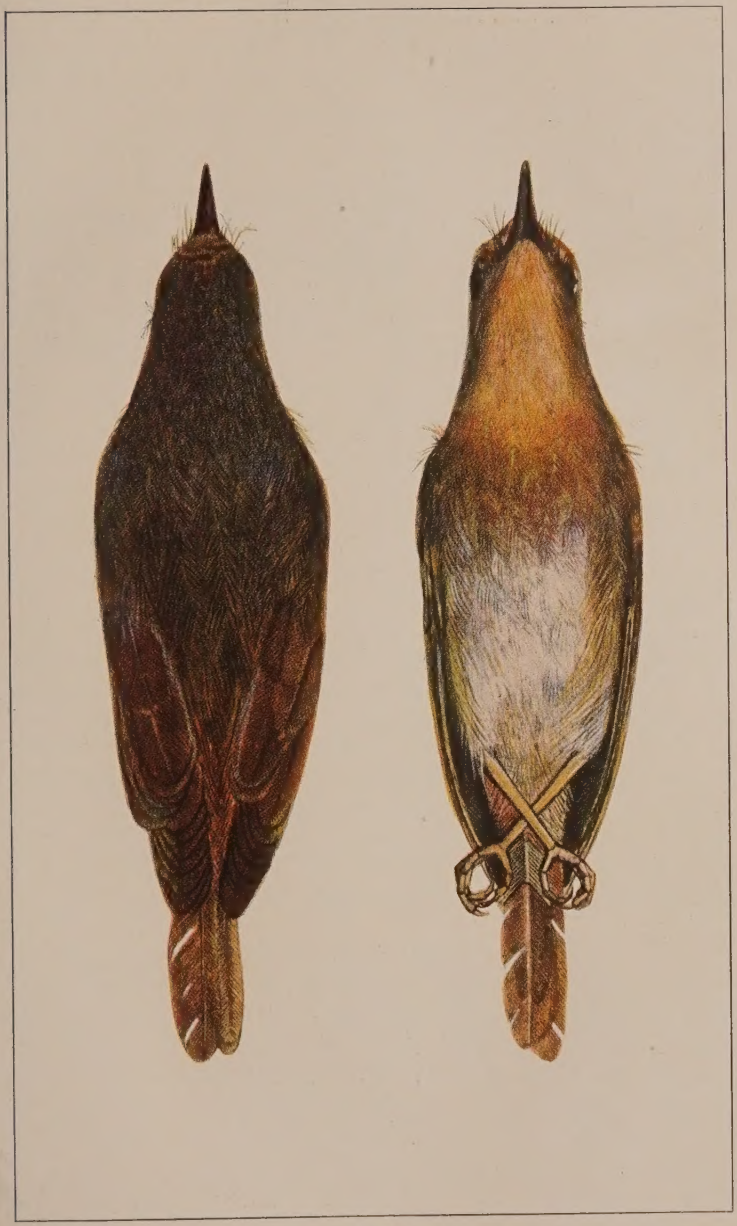

PLATE 1.